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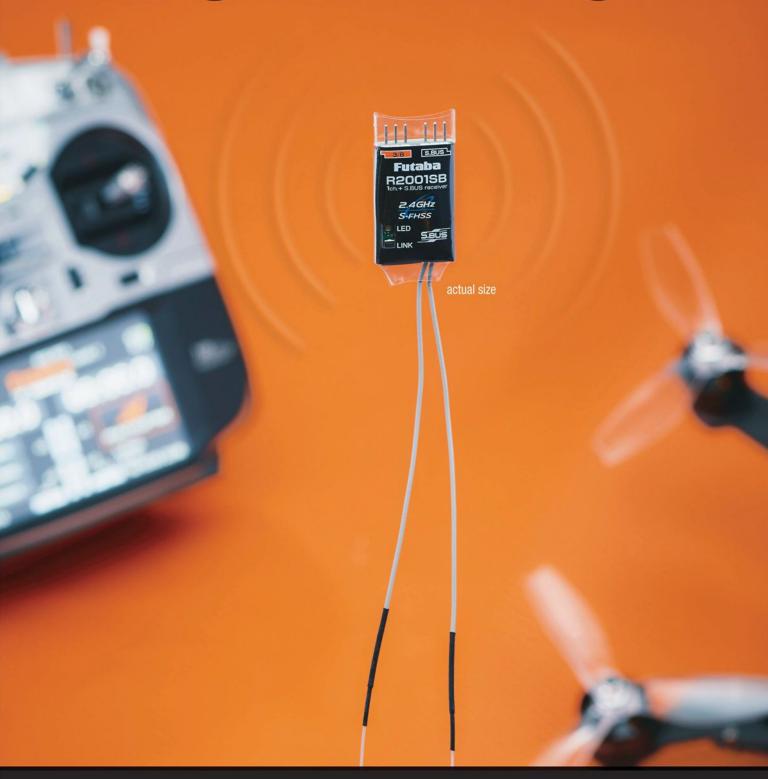




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ON THE COVER: A mini version of the lethal ground-attack aircraft, E-flite's UMX A-10 is an impressive flier. (Photo by Peter Hall)

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LiPo 2-8 Cells







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NiCd 1-20 Cells





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SERIOUS FUN:

Preflight

BY DEBRA CLEGHORN | EXECUTIVE EDITOR

Our Favorite Warbirds

It's no secret that the editors of this magazine are partial to warbirds: bombers, fighters, recon aircraft—we love 'em all! Add some OD green and military markings to a Cub and you elevate it from a civilian sport plane to a combat liaison aircraft. Doesn't that sound better? In this issue, we pay tribute to warbirds with our latest "Top 10 Warbirds" feature. Back by popular demand, this article highlights classics like a Spitfire and a P–47, but it also has a seldom–modeled Dauntless and a B–25 Mitchell, which comes ready–to–fly with incredible scale details. Our picks range

from small and midsize electrics to giant scale. However, they all have scale fidelity, excellent craftsmanship and materials, and excellent flight characteristics. Limiting our list of favorite warbirds to 10 wasn't easy, but we're confident that you'll be pleased with any of these planes.

IN THIS ISSUE

Many of you have requested more information on multirotors and drones, so this issue boasts a new column: Drone Talk, This month, our West Coast senior editor (and drone racer) John Reid gives us the inside scoop on getting started in FPV racing, so if you're looking for a new thrill, you won't want to miss this premiere column. In Ultimate Electrics, you'll find out exactly what's involved with converting to clean, reliable e-power, and in the workshop this month, senior technical editor Gerry Yarrish details how to sheet a curved fuselage like that of his Ziroli Skyraider. Warbird lovers will appreciate our complete coverage of the recent 12 O'Clock High fly-in, and flying enthusiasts of all stripes will be interested in our review of the latest new flight simulator, RealFlight RF-X—a completely reworked edition of the popular sim, which sets a new standard for realism.

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Whoever said nothing good in life is free certainly didn't know about our free weekly e-newsletter! Subscribe now to get the latest news, exclusive sneak peeks, entertaining videos, flight techniques, how-tos, and more delivered to your inbox every Friday morning. **To sign up, just head to ModelAirplaneNews.com** and enter your email address in the box on the right of the homepage. It doesn't get any easier than that! While you're online, drop us a note at MAN@ airage.com and let us know how we're doing. Your comments and suggestions help us to continue to make Model Airplane News the industry's premier RC airplane magazine. We hope to hear from you soon!





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- Length: 755mm
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- Tail Blade Length: 69mm
- Main Rotor Diameter: 850mm
- Tail Rotor Diameter: 181mm
- Weight(w/o Battery): 860g





















Airwaves

YOUR FEEDBACK

We love hearing from our readers: Your emails, tweets, and comments guickly let us know what you'd like to see more (or less!) of in upcoming issues and online. Here's what some of you are saying about Model Airplane News magazine.

III Facebook Kalinin K-7

This amazing 16-foot multiengine giant is a heavy experimental aircraft, designed and tested in the Soviet Union back in the early 1930s. Built and flown by Rainer Mattle, this monster 99-pound model is powered by six 15cc ASP gas tractor engines and one electric pusher motor. Built up from wood, the Kalinin K-7 is also equipped with 16 servos, functional brakes, and steerable front wheels. A real handful to transport, the model can be disassembled into six modules to ease the task. With a wingspan close to that of a B-52, there was only one full-size K-7 ever built, and it crashed after only seven flights due to a tail-boom failure, so it's doubtful you'll run into another RC version. Thanks to RCHeliJet for taking a video of this monster model at the recent Hausen Am Albis event in Switzerland.



John Thomas: I never fail to find something interesting on your Facebook page. Keep these videos coming.



Zia Khan: Amazing to LIFT those structures in the AIR...and bring back home.



Caleb Ramos: Heck, yeah! Hove seeing aircraft like this get modeled!



Jim George: What a beast. They actually flew those in WW II.



ModelAirplaneNews.com Repairing Fiberglass Cowls

We posted a detailed article showing how you can repair a worn-out and cracked engine cowl. Fiberglass is light and strong, but when it gets damaged, it is a lot less expensive to repair it than to purchase a replacement. This step-by-step how-to article showed how to make repairs all but invisible, and our website fans had a lot to say.

Bill Rendall: Here's another tip. To strengthen mounting holes, I press a brass eyelet through and flare over the inside lip with a center punch. The attachment screws then go through the eyelet and not just bare fiberglass.

George Fyntikakis: Very nice technique.

Adam Murphy: I like the MAN workshop tips. Thanks for this helpful tip.

Ricardo Machado: Great how-to! The close-up pictures helped a lot. Well done.

☑ In Our Mailbox

Glassing Wings

I thought that Denny DeWeese's article on fiberglassing wings in your January issue was very good. The system I have used for about 20 years is less intensive and takes less time. I use .75-ounce fiberglass cloth, and I too use Z-Poxy Finishing Resin. I add 40% denatured alcohol so that the resin is the consistency of water. Hay the cloth down and use a throwaway brush to apply the thinned resin. If it begins to thicken as I spread it, I just add more alcohol. Once cured, I trim/sand off the edges and don't add a second layer of resin. I then thin down some lightweight spackle and brush it on to fill the cloth's weave. When dry, I sand most of it off and then apply a second coat. After it is sanded smooth, I use Rust-Oleum Hot Rod primer. I fill any imperfections with body putty. After a good, wet sanding, the model is ready to paint.—Jerry Kraft, Oregon City, OR

Jerry, thank you for writing and sharing your own fiberglassing technique. As they say, "there's more than one way to skin a plane!" Your models look great.-GY

Flying Twins

I recently read an article in MAN about flying twin-engine RC airplanes. It was written by Nick Ziroli and the article had a lot of great advice as well as engine setup tips for reliability. I know that Nick has designed a lot of warbirds, but I am wondering if he ever designed a twin Beech D-18. My dad owned one back in the late '60s and early '70s, and I have always wanted to build one. Can you let me know if and where I could find a set of plans? Thanks and keep up the good work.—Mitch Branford, Boston, MA



Mitch, yes, indeed-Nick Ziroli did design a D-18, and he flew it for several years. Built to a scale of 2.4 inches to the foot, the twin Beech has a 114-inch wingspan and is 80 inches in length. It has a wing area of 1,950 square inches and is designed for engines in the 38cc to 50cc displacement range. I have seen several versions fly, and Nick's prototype was powered by two Zenoah G-38s. His plans are available from Nick Ziroli Plans (ziroligiantscaleplans.com). Cowls and canopy as well as other accessories are also available. - GY





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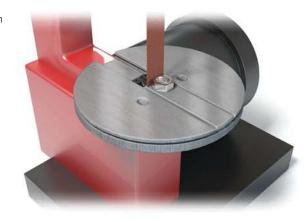
USEFUL HINTS FROM MODELERS | Illustrations by Richard Thompson

SCALE SEATBELT STRAPS

I wanted to add details to the open cockpit of my ARF Golden Age Racer. Some obvious items often not duplicated are the shoulder harness and seatbelt straps. I happened upon the perfect answer in the scrapbook

section of an arts-and-crafts store: packages of miniature belt buckles in various sizes and 3/8-inch-wide tan ribbon that looked exactly like miniature straps (the edge stitching was printed on). I had already made an aluminum bucket seat from roof flashing (to hide my servos), so linserted the ribbon through the belt buckles and glued them into place. I added some stick-on aluminum duct tape to the ends of the straps to form convincing attachment plates. Best of all, everything cost less than \$5 and really adds a lot to the scale look of the cockpit.

Whitney Philbrick, Nolensville, TN



NUT ADJUSTMENT

I fly electric—powered models, and most electric motors have metric prop adapters. I still have a Fox plug wrench in my pit box and want to use it instead of buying a metric prop wrench. I sand the metric nut on my Dremel belt sander, rotating the nut to "adjust" (sand) all six sides of the nut. It doesn't take much until it fits into the plug wrench. I've been using this trick for years.

Dennis Sumner, Canton, MI

TAPE PULL TABS

I really love foam warbirds. They have fairly light wing loadings and fly great. Being electric–powered, most have a large battery hatch in the fuselage, held in place with strong magnets. Sometimes it is difficult to remove the hatch cover without damaging the soft edges, so I came up with an idea that really works well. I stick about 2 to 3 inches of clear packaging tape to the inside of the hatch cover, then I double it over to form a transparent pull tab. I make the tab long enough so that about an inch is exposed when the hatch is in place; you hardly notice it.



COWL HARDPOINTS

When I attach a fiberglass cowl to my plane, I do not simply screw it to the side of the model; typically, a screw hole in soft balsa will quickly strip out. So I mark the positions for the attachment screws and install short lengths of dowel and glue them in place. I then drill a pilot hole through the holes in the cowl and thread the screws into place with a flat washer to protect the cowl. A small drop of CA glue hardens the threads in the dowels, and they last for years. This method allows quick cowl reattachment and alignment without guesswork as the dowels fit into the holes in the cowl (flush with the outside) and the cowl is positioned exactly the same every time.

Yuliy Lieb, Newport Beach, CA



SEND IN YOUR IDEAS! We want your ideas for Tips & Tricks! This month's winners will receive a *Model Airplane News* baseball cap. Send a photo or rough sketch and a brief description to MAN@airage.com or *Model Airplane News*, c/o Air Age Media, 88 Danbury Rd., Wilton, CT 06897 USA.



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Pilot Projects

SHOWCASING WHAT YOU BUILD & FLY | Email entries to: MAN@airage.com



• P-47 THUNDERBOLT

Lane Crabtree, Springtown, TX

To make his 85-inch-span Top Flight P-47D ARF unique, Lane writes that he replaced the nose art with that of "Slightly Dangerous" for a "fantasy scale" scheme. A DLE-55 engine turning a Xoar 22x10 prop provides the power, and a Best Pilots figure is in the cockpit. (Photo by Nancy Abby)



About 33 years after building the Dan Santich plan (FSP10851 from Air Age Store.com), Dennis decided to reduce the wingspan from 70 to 54 inches. Powered by an RCGF 20cc engine, this new aerobat is covered with UltraCote and uses a Spektrum DX7 radio.



C AEROCOMMANDERS

Juan Vadillo & Eduardo Roesch, Guatemala City, Guatemala

Each of these scratch-built beauties uses a 340-watt motor running on a 3-cell 4000mAh LiPo pack. Equipped with retracts, each plane weighs 4 pounds. Eduardo writes that they are "fast and powerful, and it's a lot of fun to fly them. We are training to fly in formation for our club's sport scale event."

SEND IN YOUR PICTURES! Model Airplane News is your magazine, and we encourage reader participation. Email your high-resolution images to MAN@airage.com, with your contact information and details on your project. Every pilot we feature will receive a Model Airplane News baseball cap, and the "Pilot Project of the Month" winner will receive a Model Airplane News "swag pack."



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Top 10 Warbirds

PERFECT FOR YOUR WW II HANGAR, ANY OF THESE TRIED-AND-TESTED CLASSICS WILL MAKE YOU FEEL LIKE AN ACE

BY **THE MODEL AIRPLANE NEWS CREW**PHOTOS BY **PETER HALL**

From trainers and bombers to transports and fighters, military aircraft come in all shapes, sizes, and colors. These top 10 editors' picks were chosen from past *Model Airplane News* reviews, and we took into consideration performance, looks, quality, and value. If you're looking to add a new fighter or bomber to your hangar, give this article a look. We'll bet you'll find a new favorite somewhere in this squadron.

Phoenix Model Spitfire 20-30cc

Flown during the Battle of Britain and in every theater of World War II, the Supermarine Spitfire was one of the most famous warbirds used during the Second World War. The 1/6-scale Phoenix Model Spitfire has many scale features that capture the elegant design and form of the original. Intended for intermediate pilots, the Phoenix Model Spitfire ARF is equipped with retracts and flaps and can be powered with a 20cc to 30cc gas engine, or the equivalent glow engine or brushless outrunner motor. Included are the prebuilt wing panels, fuselage and tail assemblies, mechanical retracts with CNC-machined metal struts and main wheels, the tailwheel, spinner, engine mount, motor mount, painted fiberglass engine cowling, formed canopy, instruction manual, fuel tank, and decal sheet. All of the control surfaces come with the hinge slots already cut and ready to accept the included CA hinges. For a smooth takeoff, advance the throttle positively and smoothly, and anticipate the left-turning tendency; be ready with the rudder to keep the plane going straight. With several scale features, great-flying characteristics, and quick assembly, the Phoenix Model Spitfire is a warbird you'll want to add to your hangar.

OUICK SPECS

Weight: 13 lb. 6 oz.

Model: Spitfire 20-30cc GP/EP ARF
Manufacturer: Phoenix Model
(phoenixmodel.com)
Distributor: Tower Hobbies
(towerhobbies.com)
Type: GP/EP ARF
Wingspan: 71 in.
Wing area: 821 sq. in.

Wing loading: 37.54 oz./sq. ft.

Power req'd: 20-30cc gas engine or
450Kv brushless outrunner motor
Radio req'd: 6+-channel



TOP 10 WARBIRDS

FMS Typhoon 1100mm
The Hawker Typhoon was one of only a few WW II aircraft capable of taking on the Luftwaffe's FW 190s at low altitude. Equipped with four 20mm cannon and later equipped with rockets, the Typhoon quickly became the most successful low-level ground-attack aircraft to come the mean and dangerous lines of the full-size aircraft, and it has performance to match. A receiver-ready foam warbird, it takes less than 20 minutes out of the box to get the Typhoon ready to fly. Not included are a 6-channel transmitter and receiver, and a 3S 2200mAh LiPo flight battery and charger. All the servos as well as the brushless motor and the speed controller come factory installed. The Typhoon has split flaps and electric-powered retracts, which are also factory installed. With flaps fully deployed, you can shorten the Typhoon's landing approach by flying a steeper descent without gaining excess airspeed.

QUICK SPECS

Model: Hawker Typhoon

Manufacturer: FMS (fmsmodel.com) Distributor: Force RC (forcerc.com)

Type: Receiver-ready ARF
Wingspan: 43.3 in.
Wing area: 305.4 sq. in.
Weight: 45.6 oz.
Wing loading: 21.5 oz./sq. ft.
Motor incl'd: 3536 850Kv brushless

Radio req'd: 6-channel

E-flite/Horizon Hobby UMX B-25 Mitchell

Starring in movies like *Thirty Seconds over Tokyo* and *Catch-22*, the twin-engine B-25 Mitchell medium bomber has had lots of camera time. An exceptionally sturdy combat aircraft, approximately 10,000 B-25s were produced during WW II, and they're valued today as popular airshow performers. The new UMX B-25 Mitchell from E-flite is an impressive micro-size warbird foamie. It has a very accurate scale outline and weighs only 3.3 ounces, making it a pilot-friendly twin-engine bomber. The UMX B-25 is a BNF Basic airplane and features AS3X flight stabilization. It comes ready-to-fly with your own Spektrum DSM2/DSMX transmitter and 1S 300mAh LiPo flight battery and charger. With its onboard AS3X stabilization system taking care of pitch, roll, and yaw, this little B-25 is extremely stable. It feels like a larger airplane and is not overly affected by gusts.

e-fliterc.com; \$99.99

QUICK SPECS

Model: UMX B-25 Mitchell

Manufacturer: E-flite (e-fliterc.com)

Distributor: Horizon Hobby (horizonhobby.com)

Type: BNF Basic twin bomber

Wingspan: 21.65 in. Wing area: 63.80 sq. in.

Weight: 3.30 oz.

Wing loading: 7.45 oz./sq. ft.

Power incl'd: Two 8.5mm geared brushed

Radio req'd: 4-channel



TOP 10 WARBIRDS

E-flite/Horizon Hobby Carbon-Z T-28Big and impressive, the new T-28 Trojan from E-flite joins the rest of the Carbon-Z

lineup of large molded-foam scale models. The Trojan is a Bind-n-Fly (BNF) Basic model requiring completion of only a few minor mechanical assembly tasks. All you need to add is a LiPo flight battery pack and a 6-channel DSMX-compatible transmitter to which the installed Spektrum 6-channel AR636A receiver can bind. Only six main pieces of molded Z-Foam plus a molded polystyrene plastic cowling make up the airframe. Each of these comes equipped with all the required parts for the specific component; flap servos, horns, linkage parts, and the electric retracts come already installed. No adhesives are required anywhere! The T-28 comes with the AS3X flight-stabilization system, and whether it is activated or not, the big T-28 is a great-flying model with very gentle flight qualities. The flaps are very effective, and without lowering them, the model seems to glide forever. e-fliterc.com; \$519.99 (BNF)



Model: Carbon-Z T-28

Manufacturer: E-flite (e-fliterc.com)

Distributor: Horizon Hobby (horizonhobby.com)

Type: BNF sport scale
Wingspan: 78 in.
Wing area: 1,073 sq. in.
Weight: 11 b. 13 oz.

Wing loading: 25.36 oz./sq. ft.

Power incl'd: 60-size 500Kv brushless outrunner motor
Radio req'd: 6-channel







Top Flite P-47 Razorback

The Republic P-47 Thunderbolt was one of the largest and heaviest single-engine fighters of WW II. Armed with eight .50-caliber machine guns, the "Jug," as it's affectionately called, could really dish out punishment, and it was sturdy enough to take it as well. The Razorback version of the Top Flite P-47 Thunderbolt captures all the aggressive lines and attitude of the full-scale Jug, and it is loaded with scale details. The plane features a one-piece wing, is built from laser-cut balsa and light-ply parts, and is completely sheeted. Expertly covered with flat-military MonoKote, the P-47 features a matching painted fiberglass engine cowl, formed canopy, painted fiberglass gear doors, quality hardware, and a fuel tank. Powered by a DLE 61cc gas engine, the Razorback has a solid control feel and is an undemanding warbird to fly. With ample wing area and a long tail moment, the Jug is smooth and stable in both high- and low-speed passes. It's neutrally stable and at all not twitchy.

top-flite.com; \$749.99

QUICK SPECS

Model: P-47 Razorback

Manufacturer: Top Flite (top-flite.com)
Distributor: Hobbico (hobbico.com)

Type: Giant-scale ARF Wingspan: 85 in. Wing area: 1,329 sq. in. Weight: 21 lb. 6 oz.

Wing loading: 37.06 oz./sq. ft.

Power req'd: 50-61cc gas or RimFire Power

65cc 160Kv electric motor Radio reg'd: 6+-channel





TOP 10 WARBIRDS

Hangar 9/Horizon Hobby Corsair 60cc If you are old enough to have watched the TV series Baa Black Sheep, then

If you are old enough to have watched the TV series $Baa\ Baa\ Black\ Sheep$, then you'll know what the Corsair looked like. The F4U Corsair was a powerful and deadly South Pacific fighter. It was nicknamed "Whistling Death" by the Japanese, who regarded it as the most formidable American fighter of WW II. Designed for scale warbird enthusiasts who are proficient intermediate pilots, the 60cc Hangar 9 F4U-1D Corsair features balsa and plywood construction with a fiberglass wing center section. The plane is covered with blue UltraCote and comes with four sets of scale decals. The Corsair doesn't come with landing gear, so it requires Robart 90-degree rotating retracts. Other features include a three-piece wing with multipanel flaps, a full cockpit interior with a sliding canopy, a scale retractable tailwheel, and a dummy radial engine. In the air, the plane performs very well and feels stable when slowed down for landing. At high speed, it is solid and very easy to control. It tracks well in both level flight and in steep banking turns. hangar-9.com; \$999.99

QUICK SPECS

Model: F4U-1D Corsair 60cc

Manufacturer: Hangar 9 (hangar-9.com)

Distributor: Horizon Hobby (horizonhobby.com) Type: Giant-scale 60cc ARF

Wingspan: 85.5 in. Wing area: 1,380 sq. in.

Weight: 31 lb.

Wing loading: 51.75 oz./sq. ft. Engine req'd: 3.1-3.6 2-cycle gas

Radio reg'd: 8-channel



Phoenix Model Dauntless

The Douglas SBD Dauntless from Phoenix Model brings the memories of dive-bombers and scout planes alive again. The Dauntless was responsible for the fatal blows delivered to the Japanese carriers at the Battle of Midway. Framed in laser-cut balsa and ply, the Phoenix Model Dauntless sports the early-war, three-color scheme of Corsair blue, light blue, and white in durable Oracover. The Dauntless can use electric or glow power systems and includes very sturdy mechanical retracts that are preinstalled. A 6-channel transmitter and receiver are required as well as up to seven standard servos and one low-profile retract servo. The control surfaces come preslotted for installation of the included CA-type hinges. In the air, the Dauntless feels like a larger plane; it's fast and covers ground quickly. Its unique wing design with flat center section and dihedral outboard of the landing gear adds to its stability. This plane tracks really well, and we did not feel the tail dropping in tight turns, though we still coordinate rudder with aileron most of the time. At speed, it will yank and bank with the best of them.

QUICK SPECS

Model: SBD Dauntless Manufacturer: Phoenix Model

(phoenixmodel.com)

Distributor: Tower Hobbies

(towerhobbies.com)
Type: EP/GP ARF

Wingspan: 56.7 in. Wing area: 651 sq. in. Weight: 7 lb. 2 oz.

Wing loading: 28.9 oz./sq. ft.

Power req'd: .46 to .55 glow or electric

Radio reg'd: 6-channel



Durafly Curtiss P-40N Warhawk

The last production version of the famous fighter line, pilots considered the P-40N to be the fastest and finest of the Curtiss fighters. Durafly's Warhawk is at a higher level in terms of scale detail, functional features, and power system. Some of its features are 110-degree-rotating retractable landing gear, an operational electromagnetic bomb-drop system, split flaps, and five decal sets to choose from. Molded out of carbon-reinforced EPO foam, the P-40N has a nicely painted finish with molded-in panel lines. It is a plug-and-fly (PNF), which means that only a receiver, LiPo flight battery, and 6-channel transmitter are required to get the model airborne. The brushless motor, speed control, all the servos, and control linkages come installed, and there's even a pilot figure in the cockpit. The model is neutrally stable, and if you have limited warbird experience, we suggest you set the center of gravity to the forward-most point for a little added stability.

QUICK SPECS

Model: Curtiss P-40N Warhawk 1100mm Manufacturer: Durafly (durafly.com) Distributor: HobbyKing (hobbyking.com)

Type: PNF sport scale Wingspan: 43.3 in. Wing area: 325 sq. in. Weight: 3 lb. 3 oz.

Wing loading: 14.13 oz./sq. in.

Power incl'd: Durafly 3536 900Kv outrunner Radio reg'd: 6-channel (required)





FMS A6M5 Zero

Made infamous by the Japanese attack on Pearl Harbor in 1941, the A6M5 Zero ranks way up there with the WW II-era warbird lovers, and the new 1100mm PNP (plug-and-play) A6M5 Zero from FMS is sure to be equally popular. The FMS Zero is packed with scale features like working flaps and retracts, and because it's a plug-and-play airplane, everything except a transmitter, receiver, and flight battery are included. There's even some contact cement to glue on a few of the plastic details included in the box. Constructed of durable EPO foam, with reinforcements throughout to keep flight maneuvers crisp, the Zero is painted in iconic dark green, complete with molded-in panel lines. Six preinstalled servos (two digital and four analog) perform flight-control duties. Unlike larger-scale counterparts, the 1100mm size makes it easy to leave assembled during transport, so you can maximize your available flight time at the field. Although recommended for expert pilots, we see nothing that's beyond the ability of the advanced intermediate flier. Excellent instructions, easy assembly, and great flight characteristics ensure success.

fmsmodel.com; \$179.99

QUICK SPECS

Model: A6M5 Zero 1100mm

Manufacturer: FMS (fmsmodel.com)

Distributor: Force RC (forcerc.com)

Type: Sport scale Wingspan: 43.3 in. Wing area: 311.5 sq. in. Weight: 45.2 oz.

Wing loading: 20.8 oz./sq. ft.

Battery req'd: 3S 2200mAh 25C LiPo

Radio reg'd: 6-channel

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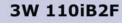
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TOP 10 WARBIRDS

HobbyKing B-17 Flying Fortress
The B-17 Flying Fortress is one of the most recognized bombers to come out of WW II. With a 1875mm span, the HobbyKing B-17 is made out of EPO foam and includes everything except a transmitter, receiver, and LiPo flight battery. With all wiring preinstalled, assembling this fourengine bomber couldn't be easier. If you are an intermediate flier, it is a great introduction to multiengine scale electric flying. Assembly is simplified by tabs and matching recesses that ensure that all the tail and wing surfaces line up accurately. The B-17 has flaps and retracts, and all the control rods for the tail surfaces and steering come installed. The four 850Kv outrunner motors, powered by a single 3S 5000mAh battery, provide good power and duration. The B-17 is rock-solid and has enough dihedral to provide excellent stability. It tracked beautifully right from the takeoff run, and it continued that during the climbout. It's

QUICK SPECS

Model: 1875mm B-17 F/G Flying Fortress (V2) Manufacturer: HobbyKing (hobbyking.com)
Distributor: HobbyKing (hobbyking.com)
Type: PNP electric sport-scale multiengine bomber

Type: PNP electric sport-scale mais.
Wingspan: 73.82 in.
Wing area: 729 sq. in.
Weight: 105 oz.
Wing loading: 20.75 oz./sq. ft.
Power incl'd: Four 40mm 850Kv brushless outrunners
Radio req'd: 6-channel







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E-FLITE/HORIZON HOBBY UMX A-10

A micro attack jet with twin-ducted-fan power

BY GERRY YARRISH PHOTOS BY PETER HALL



The new UMX A-10 from E-flite is an awesome micro-scale version of the full-size Warthog, and it is part of the BNF Basic series. It comes out of the box completely assembled and ready to fly, requiring only to be bound to your own DSM2/DSMX-compatible transmitter and a 2S 800mAh LiPo flight battery (not included). Let's take a closer look.

SPECIFICATIONS

MODEL: UMX A-10 MANUFACTURER: E-flite (e-fliterc.com) DISTRIBUTOR: Horizon Hobby

(horizonhobby.com)

TYPE: BNF Ultra-micro UMX twin-fan jet

WINGSPAN: 22.1 in. WING AREA: 83.7 sq. in.

WEIGHT: 5.9 oz. WING LOADING: 10.15 oz./sq. ft.

LENGTH: 20.3 in.

POWER INCL'D: Two BL180m 13500Kv inrunner RADIO REQ'D: 4-channel DSMX/DSM2-

compatible PRICE: \$149.99

GEAR USED

RADIO: Spektrum DX9 (spektrumrc.com); servos and receiver installed MOTORS: Two BL180m 13500Kv inrunner brushless (installed) BATTERY: E-flite 2S 800mAh 30C LiPo (e-fliterc.com)

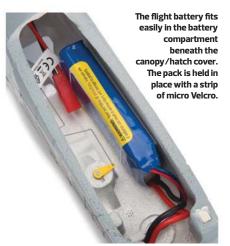
HIGHLIGHTS

- Excellent flight performance
- No assembly required
- **ᢒ** Great scale looks



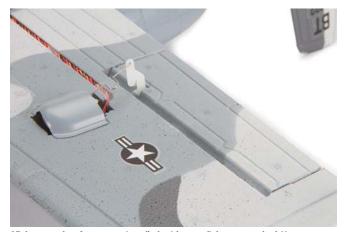


include molded-in panel lines and hatches, a clear cockpit canopy and pilot bust, and a plastic mini gun in the nose. As mentioned, everything is ready to go, including twin 28mm ducted fans and their 13,500Kv brushless motors. Dual functional rudders and a steerable nosewheel provide great ground handling on smooth surfaces and impressive yaw authority during flight. All the control surfaces are hinged into place, and the control linkages are all connected with nothing needing additional assembly. Four 2.3g linear Long Throw servos and a DSMX UM 6-channel AS3X-enabled receiver (with twin brushless ESC) come factory installed. The aileron servos are installed in the wing panels and have formed plastic covers to protect them during landings in the grass.





The landing gear are removable for taking off from grass flying fields. Here is right main landing gear inserted in its plastic hardpoint.



All the control surfaces come installed, with servo linkages attached. Here, you see the aileron linkage with the formed servo cover.



The dual rudders are functional and are controlled by this linkage under the horizontal stabilizer.



IN THE AIR

The twin-ducted-fan power systems produce an abundance of power, and the A-10's light wing loading gives it a pilot-friendly flight performance. The AS3X flight-stabilization technology built into the receiver does a great job keeping the small Warthog well behaved, even when there is a bit of a breeze blowing outside. For outdoor flying from a grass field, remove the landing gear and hand-launch the A-10. It has plenty of power, so an easy overhand toss is all that's needed. If you are flying from a smooth surface, slowly advance the throttle and let the A-10 gain airspeed, keep it running straight with rudder, and lightly apply a little backpressure on the elevator stick. As soon as the model lifts off, ease off the back pressure and let the model gain altitude at a shallow departure angle.

In production from 1977 to 1984, the Fairchild/Republic A-10 Thunderbolt II (also called the Warthog) was designed for the USAF as a close-air-support aircraft. Intended as an improvement on the available performance of the Douglas A-1 Skyraider (which was also relatively slow, had light firepower, and was vulnerable to ground fire), the A-10 was designed around the 30mm GAU-8 Avenger rotary cannon. Its airframe was also designed for durability, which included titanium armor plating to protect the cockpit and aircraft systems, enabling the A-10 to absorb a significant amount of damage and keep on flying.

Going through several upgrades, the A-10 has avoided several congressional attempts to retire it. With its exceptional service record, it served in Operation Desert Shield and Operation Desert Storm against Iraq's invasion of Kuwait. Also participating in other conflicts, such as those in Grenada, the Balkans, Afghanistan, and Iraq, and against ISIS in the Middle East, the plane has had various airframe modifications, improvements, and wing replacements that have extended the A-10's service life, now expected to extend to 2040.

GENERAL FLIGHT PERFORMANCE

Stability: The wing has plenty of dihedral for additional built-in flight stability. With the AS3X system, the A-10 has the feel of a much larger airplane and it is extremely stable, unbothered

by sudden gusts.

Tracking: With the two large functional rudders, the A–10 tracks as if it's on rails. On the ground as well, there's little need for rudder correction to stay in a straight line on takeoff.



Covering the battery compartment is a clear plastic canopy, with a micro pilot bust inside.



Here, you see the right-side motor impeller in its engine nacelle. The two power systems provide great thrust for impressive flight performance.



Aerobatics: As with all airplanes, aerobatic and vertical performance is a factor of how much power you have available. With the A-10, the sky's the limit as the twin-ducted-fan units

provide plenty of thrust. Big loops from level flight are a nonissue, and you can do everything else in the book. Rolls can be fast or slow and precise, and you can do Cuban-8s till the cows

The UMX A-10 is a

BNF Basic model, so you need to

supply your own

the Spektrum

transmitter. I used

DX9, which binds

come home. Inverted flight and even knifeedge passes are all easily accomplished. **Glide and stall performance:** The A-10 has such a light wing loading that accidentally stalling and having the model drop out of a maneuver or a turn is unlikely. Pulling the throttle back and raising the nose some produces some very controllable slow passes, again with plenty of stability. For landings, just lower the throttle and bring the nose down a bit. Once you are just above the ground, let it settle in and apply up-elevator to slow it just before touchdown.

Spektrum Control

Ideally suited for any of the UMX BNF Basic airplanes in

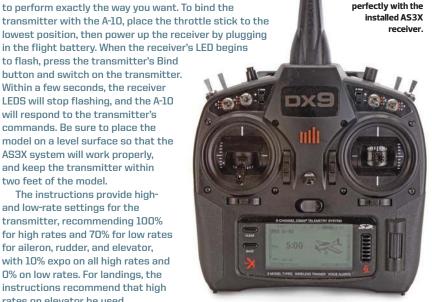
the E-flite line, the Spektrum DX9 was the transmitter

I used for this review. It binds quickly and provides

programming flexibility for you to fine-tune the A-10

transmitter with the A-10, place the throttle stick to the lowest position, then power up the receiver by plugging in the flight battery. When the receiver's LED begins to flash, press the transmitter's Bind button and switch on the transmitter. Within a few seconds, the receiver LEDS will stop flashing, and the A-10 will respond to the transmitter's commands. Be sure to place the model on a level surface so that the AS3X system will work properly, and keep the transmitter within two feet of the model.

The instructions provide highand low-rate settings for the transmitter, recommending 100% for high rates and 70% for low rates for aileron, rudder, and elevator. with 10% expo on all high rates and 0% on low rates. For landings, the instructions recommend that high rates on elevator be used.



PILOT DEBRIEFING

I found that there is a bit more speed to be had if you remove the landing gear. This both reduces drag and decreases weight ever so slightly, and you can make some crazy low full-power passes down the runway. The sound of the twin high-revving motors is hard to beat. After making your low strafing pass, pull into a steep climbing exit and do a victory roll...or three!

BOTTOM LINE

Combined with my Spektrum DX9 transmitter and a 2S 800mAh LiPo flight battery, the new UMX A-10 from E-flite is an amazing easy-tofly two-motor jet that has great stability and an abundance of flight performance. If you have ever wanted to fly a Warthog, this micro-scale A-10 is the e-jet for you. I highly recommend it for any intermediate RC pilot. ‡





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Flight Test

Beaver 2000mm PNP

Giant model of the famous Canadian workhorse

BY KLAUS RONGE PHOTOS BY PETER HALL

SPECIFICATIONS

MODEL: Beaver 2000mm PNP
MANUFACTURER: FMS (fmsmodel.com)
DISTRIBUTOR: Force RC (forcerc.com)
TYPE: Civilian scale
WINGSPAN: 79 in.

WINGSPAN: 79 in. WING AREA: 828 sq. in. LENGTH: 51 in. WEIGHT: 8 lb. 14 oz.

WING LOADING: 24.361 oz./sq. ft.
RADIO REQ'D: 5-channel (minimum)
PRICE: \$330; floats, \$90

GEAR USED

RADIO: 10C transmitter; Futaba R617FS receiver (futabarc.com); six FMS 17g metal digital servos (installed) MOTOR: Brushless 4258-KV550 w/ 70A ESC (installed) BATTERY: Force RC 5000mAh 6-cell LiPo PROPELLER: 15x9 (included)

HIGHLIGHTS

- Wide flight envelope
- Rapid field setup with wing connector
- Scale LED navigation and landing lights
- Large size has nice presence in the air

Popularity seems to be growing in bush planes as well as in large foam aircraft. The folks at FMS and Force RC have capitalized on this trend by introducing their largest prop plane: the 2m (78-inch) wingspan Beaver. The full-scale de Havilland Canada DHC-2 Beaver is powered by a 9-cylinder Pratt & Whitney radial engine, with the primary mission to fly cargo and passengers to remote areas by land or sea. Favored by diehard bush pilots, the DHC-2 is renowned for getting into and out of the most inhospitable terrain on earth.



The FMS Beaver is highly prefabricated and requires only a few assembly steps for completion. It is constructed using lightweight yet rigid foam called EPO 52. It comes painted in a unique and appealing black-and-yellow trim scheme, and sports an abundance of scale details, such as LED navigation and landing lights, functional flaps, scale aileron and flap hinges with hidden linkages, and large tires. I opted to get the optional floats, which I consider a must-have for the Beaver if you enjoy flying

off of water. If you want to try your hand at towing a glider or banner, an optional electric retract is available.

Because the Beaver is quite large and will likely require disassembly for storage and transportation, FMS has come to the rescue. The wing and fuselage feature mating connectors that plug in when the wings are installed—no more fumbling with servo extensions! The foldout struts easily attach with wire clips, further simplifying assembly.

UNIQUE FEATURES

As expected, the FMS Beaver arrived in a large box with the parts neatly packaged. All the control surfaces are already hinged and the servos installed. Assembly begins with installing the horizontal stabilizer utilizing the carbon–fiber spar and screws, and attaching the elevator ball–link. The only gluing required is for attaching the vortex generators on the horizontal stab and wings and the Pitot tube. The rudder is installed with screws after



connecting the servo to the servo extension installed in the fuselage. The beefy aluminum landing gear has the wheels and fairings already attached, and is installed on the fuselage with three bolts.

Converting the Beaver to a floatplane is simple; remove the landing gear and attach the float set using the spreader bars and screws. The conversion from floatplane to land plane and vice versa takes literally 10 minutes. As a result, I am sure that it will see a lot of action both at the field and on the water. The servo for the float's water rudder is located in the float and connected to a servo extension in the fuselage.

The Beaver requires a minimum of a

5-channel radio for the primary flight controls and flaps. FMS uses a unique servo board located in the fuselage. The connector for the wing servos and lights is routed to the servo board, as are the other lights and servos. Servo wires are then connected from the servo board to the receiver. All the servo wires to be connected to the receiver are factory-labeled for mistake-proof installation.

The fuselage has a provision to install a retractable towhook. A brushless 4258–KV550 motor and 70-amp ESC with an EC-5 connector is installed. A spring-loaded latch holds the battery hatch securely in place and allows access to the huge battery and radio compartment.

A Velcro strip comes installed as well as two battery straps to secure the six-cell battery. A minimum of 4000mAh is recommended, but there is plenty of room for a larger battery. I used a Force RC 5000mAh battery, and the plane balanced on the center of gravity (CG) without adding any weights. The nose of the FMS Beaver seems to be a bit longer than true scale; this was mostly likely done for CG considerations and does not detract from the overall good looks of the plane. Finally, the included 15x7 prop and plastic spinner are installed.

IN THE AIR

With the Beaver's beefy landing gear and large



The functioning landing light, Pitot tube, and vortex generator are some of the neat scale features found on this plane.



Shown here is the plug-in wing connector that eliminates the aileron, flaps, and lighting servo extensions.



Unless you are a good swimmer, have a means of retrieving the plane if it is dead in the water. An RC or full-size boat is a good option.

Taxiing on calm water is no problem.

If there is any wind, taxiing can be very challenging, as the plane always wants to weathervane into the wind. Often you will need to make a 270-degree turn to turn 90 degrees.

Take off and land into the wind.

Hold full up during the initial takeoff run so that the floats don't dig into the

water. Ease up on the elevator as the plane gets "on the step," and pull back gently when the plane reaches flying speed.

Landing on water is the same as landing on land. Ideally, the plane should have a slightly nose-high attitude at touchdown, but avoid stalling it above the water.

The plane will seem to be a bit sluggish due to the weight and drag of the floats but, otherwise, will behave like the wheel-equipped version.

wheels, grass runways present no problems. Ground handling is excellent, and the takeoff roll requires little rudder correction. Even with the flaps up, the takeoff roll is relatively short. I took off with full power, turned downwind, and was awestruck by the speed of the big Beaver. At a better than one-to-one power-to-weight ratio, this plane has more than enough power to easily carry the extra weight and drag of the float set or tow a good-size sailplane. On the opposite end of the spectrum, the plane can be slowed to a crawl with full flaps. Flying at a more realistic speed at about half-throttle with occasional use of full power, I got about 10 minutes of flying time. Battery changes are a snap with the removable front hatch and roomy

battery compartment.

GENERAL FLIGHT PERFORMANCE

Stability: Being of a high-wing design, the model is very stable at any speed with the flaps up or down.

Tracking: The Beaver is definitely a stick-and-rudder plane, meaning that rudder greatly enhances the turn. Ailerons alone can be used, but turns look much nicer and have more authority with some rudder added. This is not a detraction—it is inherent in the scale design. **Aerobatics:** Even though it is not very scalelike, aerobatics are a blast with all that power on tap. I used the recommended high rates for all the controls and found the plane to be

responsive but not overly sensitive. Loops can be any size, and the model has great vertical performance. Roll rate is not especially fast, as expected by the long wing. Inverted flight, as well as any sport aerobatic maneuver, is easy and fun to do.

Glide and stall performance: The plane has a good glide ratio with the flaps up, but a little power helps overcome the drag on final approach. With full flaps, the plane can almost be stopped with a good headwind yet remain under complete control. Stalls present no surprises and needn't be feared.

PILOT DEBRIEFING

The wide flight envelope of the Beaver should provide for many entertaining flights. The five bright LED lights, which are clearly visible in daylight, will let you extend the fun into the dawn or dusk hours. If you have access to a lake, I highly recommend getting the float set—the Beaver looks like it belongs on the water.

BOTTOM LINE

FMS did a great job in engineering the Beaver for pilots who want to get in the air quickly. It takes less than an hour to assemble and set up the radio. The plane has great flying characteristics with no bad habits and can be flown by pilots past the primary trainer phase. With its abundance of power, the Beaver will also put a smile on experienced pilot's faces—whether doing aerobatics, touch-and-gos, or splash-and-gos. ‡



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TEXT & PHOTOS BY RICH URAVITCH

've been involved in the hobby since I was a youngster, and I attend a fair number of scale flyins and competitions, yet it always amazes me just how much talent is possessed by those involved in RC. From design and fabrication right up to the flying, you'd be hard-pressed to find another activity that requires as broad a range of skills as RC participation. The 12 O'Clock High event, like the three others presented by Frank Tiano (Top Gun, Florida Jets, and Red Flag), takes place at the great Paradise Field flying

event, like the three others presented by Frank Tiano (Top Gun, Florida Jets, and Red Flag), takes place at the great Paradise Field flying site located in Lakeland, Florida. These events are all spread out on the calendar to take advantage of some of the best flying weather available, and each represents and showcases what's going on in the hobby.

It has been said that interest in scratch building or even kit building seems on the decline and that prefabrication is the way of the future. That might be only partially accurate; it depends on who you're talking to, the type of event, and your definition of "building." While the majority of entries on hand at this event were "built" from highly prefabricated packages, many—especially the World War I subjects—were built from traditional kits, with others being totally scratch-built from plans, either from other designers or the builder's own. While some purists consider any level of prefabrication sufficient reason for putting the product into the "ARF" category, there is a whole different skill set required to successfully assemble the new wave of airframes being offered, particularly those in the "upscale" category, like many of the jets and warbirds. Even the most prefabricated, high-tech "ARFs" require their own separate set of skills and techniques. With this in mind, I decided to take a close look at the subjects

Smoke sure gets your attention! Chris Seiler's ESM Spitfire seemed to have more "smoke juice" than fuel! Very effective system.

on hand to get some feel for the truth in this

widely held opinion.

On the Flightline

There were a number of amazing projects on hand, not the least of which was the unique Airco DH-2 scratch-built by Todd Bixby. This enormous, 164-inch-span, pusher prop biplane was entirely the work of Todd and an aluminum tube factory, along with a forest of wood and a bedsheet factory's daily production run! I really liked this model just for what it represented in effort and perseverance. I first saw it three years ago when, like most brand new models, it was experiencing some teething problems that have since clearly been overcome. Todd flies the models in an extremely scalelike fashion, and has obviously done his homework and hung in there to get it to the point where it now is. Although you wouldn't expect it, the model performed quite well, even in stiff breezes.

As for the largest models at the event,

the blue sky during their flybys.

tied at 168-inch spans were the amazing
Curtiss B-2 Golden Age bomber built and
flown by WW I devotee Curtis Switzer and the Piper L-4 Grasshopper
built from a Bill Hempel kit by Kenneth Hurtado. The B-2 was powered
with twin Saito 1.8ci four-strokes, while the 40% Cub used a Zenoah
GT-80. While these behemoths were spectacular sitting on the ground,
they were even more so when airborne! Both models literally lit up against



40% L-4 (168-inch span), GT-80, Bill Hempel product. Ken Hurtado was airborne most of the meet, flying formation with other L-4s.

One of my favorites was the unique, trimotored Savoia–Marchetti SM–79 Sparviero (Sparrow), entered by longtime scale enthusiast Dave Voglund. His model was built from Don Smith plans and used three Zenoah G26 gas engines to easily haul its 51 pounds around. Of traditional wood construction, the SM–79 was of WW II vintage and saw extensive service as an Italian bomber. Its 136–inch span equates to 1/6 scale, and the model was large enough to command attention while still being





WW I Standout

One of the reasons folks attend themed meets like 12 O'Clock High is the opportunity to mix it up with modelers and fliers with similar interests in periods of aviation and types of aircraft. Rod Gier, at least at this event, seemed to prefer the WW I era. His Fokker D-7 was built from the Balsa USA kit, which is 1/3 scale and powered by a 3W 85cc gas engine hefting its 51-pound airframe. The colorful biplane could be seen airborne throughout the meet, and if you had a WW I machine, you could expect to be "bounced" by Rod or Curtis Switzer. Spads, Pups, even other D-7s appeared in the crosshairs and were considered fair game. Rod's skills as a builder were acknowledged with his receipt of the Best Craftsmanship award. His model clearly displayed one end of the range of the event.



Fokker groupie Rod Gier (standing), Curtis Switzer, and Mr. D-7 (the airplane) spent quite a bit of time together at the meet. Beware the "Hun in the Sun!"



The crisp, clean building and finishing on Rod's Balsa USA Fokker D-7 earned him the Best Craftsmanship award. But where's that pilot figure?



transportable. The flight I witnessed seemed to indicate that there was some sort of an engine problem. Recognizing this, Dave got the model into the landing pattern, whereupon it appeared to lose an outboard engine on final approach, causing it to bank sharply and spin into the ground. While significantly damaged, I'm sure that the model will likely fly again, knowing Dave's modeling skills, and it should—it's that unusual a subject!

Another favorite was the Skymaster 1/6-scale A-10 flown by Greg Foushi, who can always be counted on to bring something really cool to

this event. His past entries have included a BAe Hawk, another A–10, plus other warbirds, all as nicely done as his new Hawg. This nine–footer was Cheetah turbine–powered and finished in a unique gray, black, and white Alaskan scheme. Greg appeared really comfortable flying the model—the second one he has had. Unfortunately, something went wrong and the model crashed, totally destroying itself. Greg was last heard commenting about getting into an alternative, less expensive pastime, like vintage car collecting—but I'm sure he'll be back!



14-Foot Starfighter

Who isn't impressed with a 14-foot-long F-104 Starfighter that flies like it's on a wire? Amazing max power vertical climbs with afterburner simulation, smokin' high-speed passes, and remarkably smooth and uneventful landings make you think you're looking at the actual "missile with a man in it!" That's the impression you get when Brian O'Meara wraps up another sortie with this machine built from the Airworld kit. It's 1/3 scale and powered by a Behotec BT220 turbine. It's hard to believe that it's only 50 pounds, but looking inside and picking up a component or two convinces you that it can be done. Trond Hammerstadt did much of the work, and it is remarkable with its overall quality, level of finish, detail, and realism. Brian should team up with Pete Goldsmith and Ali Machinchy (with their similar Starfighters) for a formation demo. Wouldn't that be an incredible sight? Three hot sticks and incredible airplanes...we can only hope!



Brian and his lovely wife, Bonnie, were understandably proud of their F-104's appearance and performance. It's a real crowd pleaser!



The surface detail on the wingtip tanks on Brian's model matches the rest of the airplane. Outstanding replication!



Not once did the 104 driver even look up at me! He was clearly focused and might have been looking for that big black-and-yellow D-7. Maybe?



12 O'Clock High

Part of the fun and entertainment that comes from attending events like this, even as a spectator, is witnessing the genuine fun that the participants are having. Guys of like minds get airborne with airplanes of the same era and engage in impromptu, unrehearsed, and often wild encounters consisting of impressive aerial antics like tail chases, on-the-deck high-speed passes, and (as our Brit buddies call it) "beating up of the aerodrome!" Add some impressive visuals—like Chris Seiler's ESM Spitfire belching dense smoke down the length of the runway—and it's amazing! Alongside Chris, a bunch of his WW II warbird buddies took part, and judging by the way they were all smiling when they landed, everyone had a ball! But no more so than those of us on the ground; even RC veteran fliers seemed to be well entertained. Fun to watch, fun to play... what could be bad?

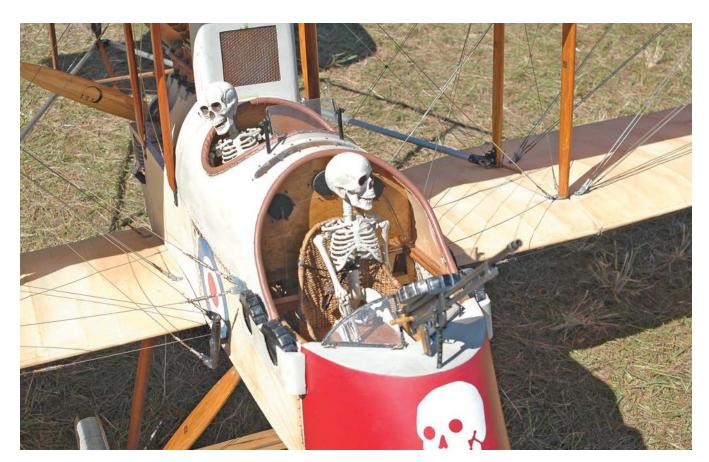
Overall, there was a huge assortment of eye candy on hand, each with its own something special to offer. Whatever your preference, at least

one representative was there, from WW I and WW II to today's frontline fighters, even biplanes, monoplanes, and jets of all eras, including the spectacular O'Meara F–104. This event offers proof that when you combine a themed event with a relaxed fly–in environment, a great site



Beautiful cockpit detailing on the ill-fated A-10 from Greg Foushi. The surface detailing is also well executed, much of it right out of the mold, but still requires a lot of attention and skill to preserve even what's already there.

with all the amenities, spectacular weather, and a great bunch of guys that really enjoy and are involved in the hobby, the result can only be positive and fulfilling for all attendants. There's something for everyone, so try to make it to next year's event—you won't be disappointed.



Todd Bixby must have sent the aircrew of his Airco DH-9 on a very long mission. This is how they returned! Good fuel economy, though!



SPECIAL AWARDS

| OI LOI/IL/W/WINDO | | | |
|---------------------------|-------------------------------------|-------------|-----------------|
| AWARD | SPONSOR | MODEL | WINNER |
| Best WW I | Fly RC | Fokker D-8 | Jesse Hinds |
| Best Golden Age | Model Airplane News | Gee Bee R-2 | Jim Record |
| Best Pre-WW II | Frank Tiano Enterprises | B-2 | Curtis Switzer |
| Best WW II | Horizon Hobby | P-47 | Eduardo Esteves |
| Best Military | JR Americas | P-51D | Chris Seiler |
| Best Civilian | Hobbico | Waco YMF-5 | David Dewitt |
| Best Craftsmanship | House of Balsa | Fokker D-7 | Rod Gier |
| Best Jet | Florida Jets | F-104 | Brian O'Meara |
| Best Biplane | EZ Balancer | PT-17 | Mike Zellars |
| Special Recognition | Futaba | F-100 | Ritchie Holt |
| Special Recognition | Spektrum | Piper L-4 | Don Janssen |
| Special Recognition | Model Airplane News | A-4 | Tim Len |
| Critics' Choice Runner-up | ZAP Glue | F-100 | Pablo Fernandez |
| Critics' Choice | Model Airplane News & Horizon Hobby | F-104 | Brian O'Meara |



On a beautiful flyby, Best WW II award recipient Eduardo Estevez banks his Moki-powered CARF P-47 for the camera.



Very attractive and visible paint scheme on Pablo Fernandez's F-100 Hun, seen here with Pablo performing some "wrenching" duties.



Ritchie Holt's entry was this beautiful F-100 in "Skyblazer" demo team markings and convincing natural metal surfaces. The Hun is a popular jet with the RC crowd.



Factor 30cc

This "mild to wild" aerobat is engineered to impress

BY GREG POPPEL PHOTOS BY DOUG KNEISLEY II & GREG POPPEL

Lightweight balsa, plywood, and carbon fiber with MonoKote covering make the Factor 30cc a strong and light airframe, allowing for a wide flight envelope. The Factor 30cc is one of the few planes that give you the ability to create wild 3D maneuvers. Great Planes engineers took the profile look and added full landing gear and wheel pants that were expanded the width of the fuselage, so everything is hidden-even the engine!-to add to the superb flight characteristics.

The Factor 30cc is a great first gas plane and great first big plane. The Factor 30cc has plug-in wings, which make it easy to transport to the field. If you are an intermediate flier or up and this was the only airplane in your hangar, you would have a smile forever! The plane will putter around the field at 1/8 throttle and still have full-on 3D capabilities when and if you want them. The cool thing about the Factor 30cc is that it is engineered for gas or electric power. I chose gas because everything I have is gas—and with a 30cc engine, the Factor 30's power-to-weight ratio is that of a 120cc plane! With the new electric motors, like the RimFire 1.60, you will get the same performance.



SPECIFICATIONS

MODEL: Factor 30cc

MANUFACTURER: Great Planes (greatplanes.com)

DISTRIBUTOR: Hobbico (hobbico.com)

TYPE: Sport fun-fly

WINGSPAN: 70 in.

WING AREA: 1174 sq. in.

LENGTH: 75 in.

WEIGHT: 12.8 lb.

WING LOADING: 24.96 oz./sq. ft.

RADIO REQ'D: 4- to 7-channel

POWER REQ'D: 30 to 35cc gas, or RimFire 160 or other

electric equivalent PRICE: \$349.99

GEAR USED

RADIO: Futaba 14SGA w/ R7003SB HV SBus receiver, HV BLS175SV SBus servos on all surfaces, and HV S3073HV SBus servo on throttle (futabarc.com); Flight Power 2S

3300mAh flight battery (flightpower.com)

ENGINE: DLE-35RA rear-exhaust stock muffler (dle-engines

.com); Flight Power 2S 1600mAh ignition battery

FUEL: 25:1 Pennzoil

PROP: Xoar 18x8 carbon (xoarintl.com)

HIGHLIGHTS

- An engineering masterpiece
- Vibrant colors
- Extremely fun to fly
- Gas- or electric-compatible



UNIQUE FEATURES

As you unbox the Factor 30cc, you see that everything in the airframe has a designated space, from the actual ignition to the ignition battery. The servos are stacked to achieve one slick-looking design. I spent some time with the MonoKote iron going over a few wrinkles in the covering and going over the seams where the stripes were put down. This plane uses all

color-rich MonoKote, and there aren't any glue or color separations. The painted fiberglass canopy/hatch, cowl, and wheel pants match perfectly.

My building assistant, Gary Mount, and I enjoyed more details during assembly. The stabilizer and elevators come drilled for pin hinges, which fit in the fuselage tight and straight. Glue the stabilizer in and then the

elevators, putting a drop of oil on each side of the pin before gluing. I prefer epoxy for its longer working time; it's also easy to clean up and has never failed me. Put your tailwheel assembly on before the rudder. The rudder and vertical fin also come drilled. The wings come hinged from the factory, but you should still pull on them to be sure that the ailerons are secure.

Although the included hardware will do the job, I chose to use my own ball links and 4–40 threaded rod for the ailerons. The control horns are easy to install. You'll notice in all the servo photos that I use aluminum servo arms because of the high demands on the large control surfaces.

A picture is worth a thousand words: Look how clean the installation is! I used the Futaba SBus system, so programming each servo was incredibly simple. The programmer has a selection dial, and I tell each servo what I want it to be (aileron, elevator, rudder, or throttle) and use the radio to reverse the servo if needed. I used a terminal block to power all the servos and then tied the terminal block to the receiver with one wire. The Futaba switches tied the battery to the system.

The one thing the manufacturer does not do a good job with is the tank filling. I used my own Viton for vent and carburetor lines as I didn't want to put a fill valve on the fiberglass cowl. I followed the vent line with the tygon tubing out the bottom of the cowl with a plug. It isn't ideal, but it's functional. [Editor's note: The manufacturer recommends keeping the fuel line in the fuselage and removing the hatch to fill the tank.]



The intricate engineering fits all the servos by layer—genius! Also, SBus makes for a clean installation.

IN THE AIR

I am fortunate to have a paved private runway to fly on in Columbus, Ohio. The DLE-35RA was very easy to start. Because it was new, I choked it until it was wet and then turned the ignition; on the fifth flip, it popped. I took the choke off, flipped it five times, and ran it, leaving the needles at factory settings for the first few flights. I set the center of gravity between the factory recommendations at 8 inches from the leading edge of the wing.

The way that the plane lifted off at 1/4 throttle indicated that taking off from grass would not be a problem. I had to add five clicks of down-elevator, two clicks of right aileron, and two clicks of right rudder. I usually spend more time than most trimming a model; I like it to fly hands off. I flew around for about five minutes to get time on the engine, brought it in to fill it up, and realized as it sipped the gas that this is going to be a fun airplane!

On this flight, I stepped up the speed; for the next six minutes, I left all the rates on low, and it felt like a large pattern plane. It stayed right where I put it: no pitch in the rolls, straight up

and down the lines, with full rolls in the middle. With the side area so big, knife-edge was a ball, and flat figure 8s and large circles required very little rudder input. I am confident that after the engine is broken in, it will do cylindrical knife-edge loops. For the last two minutes of this flight, I flew wide open—to make sure that it would stay together!—and was amazed by the plane's wide flight envelope. Next, I tested its vertical flight—it was fast and unlimited!

Click the rates to high and 3D is second nature to the Factor 30cc. The long fuselage allows smooth pattern maneuvers, but the large control surfaces on the rudder, elevators, and ailerons give it quick 3D capabilities at slow or high speeds. Hovering is almost hands-free, and torque rolls don't need any aileron input. This plane is so stable that it can fly a high alpha harrier for the entire tank.

GENERAL FLIGHT PERFORMANCE

Stability: The wing and fuselage design help the Factor 30cc in all flight modes: knife-edge, inverted, and normal.

Tracking: I hate the overused phrase "It tracks

like an arrow," but it truly does!

Aerobatics: From mild pattern maneuvers to wild 3D, the Factor 30cc is an all-in-one package.

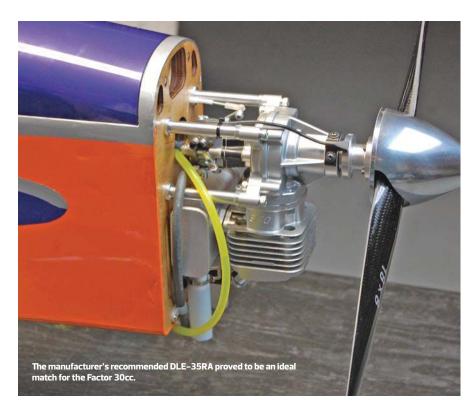
Glide and stall performance: Because everything is so light, the glide slope for landing allows you to fly this in confined areas with no ground handling issues. The stall was typical 3D: straight ahead with no tip stall.

PILOT DEBRIEFING

The Factor 30cc is that plane that gives you creative freedom to explore new maneuvers. It's powerful, compact, affordable, and fun!

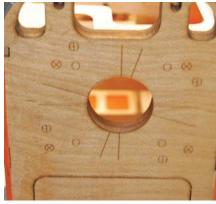
BOTTOM LINE

The Factor 30cc speaks to the quality and capabilities of the 30cc airplanes. Great Planes took a different approach to this design and created a winning sport fun-fly plane. It took a few weeks of working evenings and weekends to complete the Factor 30cc. I highly recommend the DLE-35RA for this project; the firewall markings were exact, which made the engine and cowl installation an easy fit. ‡



DLE 35cc Gasoline Engine

An ideal power choice for the new Factor 30cc, the DLE-35RA rear-exhaust engine is available from DLE Engines (dle-engines.com) for \$349.99. The DLE really surprised me; I have been the "other" engine guy for years, but I knew that the plane was designed around this engine, so I agreed to try it. The 35RA was "money" from the start: started after five flips, ran smoothly with great throttle response, and idled down to a purr. Takeoffs are easy at 1/8 throttle on a paved runway, and vertical flight is fast and unlimited. I have four flights on the DLE-35RA now, and it gets stronger every time.



The firewall is well laid out for whatever engine you choose in the 30cc category.



To get the proper spacing between the spinner and cowl, I tape old tickets to the spinner backplate, then fit the cowl for a perfect gap.

ULTIMATE ELECTRICS

TEXT & PHOTOS BY **JOHN KAUK**

Getting Started in E-power



lectric flight is more common today at the average RC field than it has ever been before. It wasn't all that long ago that I was only one of two or three people in my club who flew electric-powered planes. Today that's decidedly not the case—most of the people I see at the field have electric planes that they fly regularly. Lots of people who have never considered electric power before are trying it out or thinking of doing so, and it's easier than ever to get started.

Manufacturers make electric-power models available in several levels of completeness. What a modeler chooses depends in part on the individual's comfort with skills like assembling airframes, soldering connectors, and installing RC radio components. The easiest and quickest way to give electric power a go, especially for someone new to RC, is one of

the many ready-to-fly (RTF) or receiver-ready models available today.

READY TO FLY

RTF models come complete—everything you need for that first flight is in the box. A suitable transmitter is already bound to the receiver in the plane and programmed, and a basic charger and a battery or two are included. Airframe assembly, if necessary at all, is often complete in the time it takes to charge the battery, so the time from hobby shop to first flight can be very short.

E-flite's Apprentice S (e-fliterc.com) is an RTF trainer that I've recommended before to beginners. It includes the excellent SAFE technology, which stabilizes and restricts the plane's flight controls to make it easier to manage, and includes a panic button

programmed to recover automatically from disorienting attitudes. E-flite also has the Corsair S, which includes the same SAFE technology in a scale airframe. I've flown one of these for two seasons, and it's one of my favorite planes, especially when someone with less experience wants a turn on the sticks.

RECEIVER READY

There are a lot of bind-and-fly (BNF), plug-and-play, and receiver-ready models out there for fliers who already have radio gear that they can use with a new model. Many of these come with servos and power system installed, and require little assembly, though generally require the buyer to own or purchase a suitable charger and battery. Flyzone's Select Scale and Sport lines both have a variety of models available in both RTF and receiver-ready versions suitable





This selection of chargers is from the author's shop. The two in the center are high-wattage chargers suitable for quickly charging big batteries. The others are for smaller tasks, from micro fliers up.

for pilots of all abilities. ElectriFly's ElectroStik receiver–ready model is a version of the classic Stik model design known for its good flying characteristics. Constructed out of balsa and plywood, it's an aerobatic model suitable for intermediate fliers looking to move up from their trainer.

ROLL YOUR OWN

Modelers with more experience might choose to get into electric flight by assembling an

almost-ready-to-fly (ARF) model or building from a kit or plans. Many of the ARFs available today have been designed with electric-power options in mind from the beginning, and following the manufacturer's power recommendations is an easy way to get one in the air. Examples in this category of plane include Hangar 9's 30cc Spitfire and the Legacy Aviation Turbo Bushmaster. Both fly beautifully using the recommended power system.

Going this route takes a lot more shop time

than the other options and requires giving some thought to a variety of accessories and support equipment that might already be installed or are included with an RTF or receiver–ready model. Things like a charger, connectors, and battery meters are necessities that will need to be chosen and purchased.

CHARGERS

There are two general types of chargers: AC-powered and DC-powered. A DC-powered

Scorpion Portable USB Charger

I fly several multirotors with video cameras, and a nice feature they all have in common is a video downlink to an iPad mini. Being able to see what's being recorded is a huge benefit, and being able to see the copter's location on a map is also really helpful. The cost of all that coolness is shortened iPad battery life, as the Wi-Fi, GPS radio, and brightened screen for daylight viewing really eat up the charge quickly.

Scorpion Power Systems has come up with a nice charging solution that uses RC LiPo batteries as a power source. The Scorpion Portable USB Charger has a JST-XH socket to accept the balance connector from any 2S to 6S LiPo battery. At the other end, a standard USB port provides 5.0 volts and up to 2.0 amps to charge any device normally charged by a USB port.

Two levels of low-voltage protection are available. Mode 1, the default, stops charging when any one of the LiPo cells in the battery drops to 3.3 volts, which uses the full available charge. Mode 2, selectable by pressing the Mode button, stops charging when any one cell drops to 3.8 volts (a safe storage charge voltage). There is also a third mode available for use with non-LiPo power sources; this turns off the low-voltage protection.

The Scorpion Portable USB Charger is a great addition to my drone flying toolkit. It's available at innov8tivedesigns.com for \$19.99.



ULTIWIATE ELECTRICS

charger needs an additional power source in order to work. That could be your car battery, a 12-volt DC power-cycle battery, or an AC power supply. Chargers with very high power output may need a 24-volt power supply to produce maximum wattage.

Deciding which charger to use can be a difficult task. There are a multitude of choices available, and the decision depends on personal preferences, budget, and the modeler's long-term plans for electric flight. Someone who isn't sure about sticking with electric-power models, for example, might buy a BNF plane to try it out. If the plane flies on 3S 2200mAh batteries, the minimum charger required would need to output only 25W (11.1V x 2.2A). For charging at the flying field, a DC-powered charger works just fine plugged into a car's power port or on a separate battery. Examples of small DC chargers include the iSDT SC-608 Mini Smart Charger and the FMA CellPro Multi4.

A modeler with plans to stay with electric power and fly larger models would probably be interested in more charging capability. My primary charging kit, for instance, is powered by a 24-volt, 1500W power supply that powers two 1000W chargers. It has lots of capacity for charging big batteries at high charge rates or multiple batteries in parallel. High-capacity chargers include the iCharger 306B, Hitec's X2 700, and the CellPro PowerLab 6.

CONNECTORS

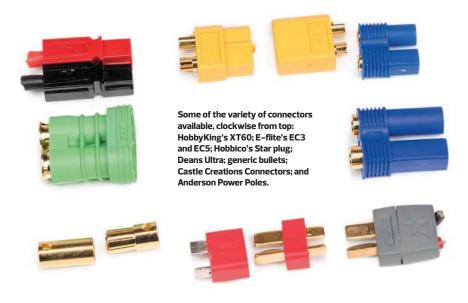
There's a huge variety of connectors available for RC models, and it seems as if every manufacturer uses a different style. A thorough discussion of them would take more space than is available here, but suffice it to say that for moderate currents up to 60A or so, there's little difference other than personal preference among the major types. E-flite's EC3, Deans Ultra, Hobbico's Star connectors, HobbyKing's XT60, and Anderson Power Poles will all work well in that case. Experienced electric-power modelers tend to standardize on one or two styles of connector to keep things simple and easy to manage. Others use them all and have lots of adapters and couplers in their charging cases.

BATTERY METERS

I've mentioned before how important it is to know the condition of your batteries. Being aware of the state of charge and balance is critical to safe charging and flight. Before flying, a quick glance at the total pack voltage and the individual cell voltages is all it takes to prevent taking off with a discharged battery or to see a low cell that might cause a problem. Another check before charging ensures that you're not putting a fully charged battery on, which could have bad results.



This is Greg Gimlick's big box of adapters and couplers. These allow him to charge and use equipment and batteries with just about any known connector if the need arises.



Like chargers and connectors, there are a lot of options for battery checkers. Make sure that the meter you're considering will work with your balance plugs—JST—XH is different from Thunder Power, and there are other types as well. Also, make sure that the meter will work with the largest battery you use—don't get a 6S meter if you use 8S packs. At a minimum, a meter should display the total voltage of the battery and individual cell voltages. Some meters show the difference between the highest and lowest cell, while some show a percentage of full charge or a "fuel gauge" graph. There are battery checkers that have different modes and will balance a pack or

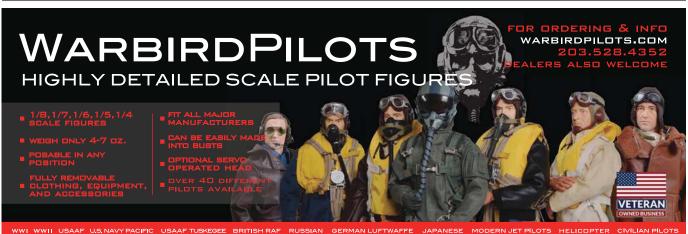
discharge it to storage voltage. The important thing is to find one that does what you want and use it regularly. The battery checkers I use are the Hyperion EOS Sentry 3, the CellLog 8, and the MaxPro LCD-6.

GET OUT AND DO IT

If you're one of those modelers who has been thinking of trying an electric plane but hasn't done it yet, there's really no reason to wait. Technology improvements—in batteries, motors, electronics, and innovative airframe construction—have made it easier than it's ever been to get the gear you need to get started with electric-powered RC. ‡







Flight Test

E-FLITE/HORIZON HOBBY ICON A5

A great-looking amphibian with power to spare

BY NICK ZIROLI SR. PHOTOS BY VINCE VELTRI & NICK ZIROLI SR.

Officially licensed by ICON Aircraft, the ICON A5 from E-flite is a park flier that lets RC pilots make amphibious flights without a lot of fuss. The Bind-N-Fly version, which I am reviewing here, comes with a brushless-motor power system and a Spektrum AS3X flight-stabilizing receiver, all factory installed. Able to take off both from land and off water, it has excellent performance and makes a great sport flier. If you're a newcomer to RC, the receiver's built-in SAFE Select function can be activated to limit both pitch and bank angles so that you don't accidentally overcontrol the plane. This function also returns the wings to level flight when you release control inputs and lets the sticks go back to neutral. Here's what I found when I opened the box.







UNIQUE FEATURES

The ICON A5 is molded out of sturdy Z-Foam, and all the surfaces have a very smooth and glossy finish. The wings, stabilizer, and other parts come in plastic bags, taped in place for safe transport. After viewing a number of online videos and photos of the full-size ICON, I realized that this model from E-flite is, indeed, an accurate scale model of the full-size amphibian. Even the automotive-style instrument panel in the model's cockpit is well detailed. The hatch has a foam rubber gasket and is held in place with two pins in the front and two rear magnets. I doubt that any water will get inside the fuselage.

For this test flight, I used my Spektrum DX9

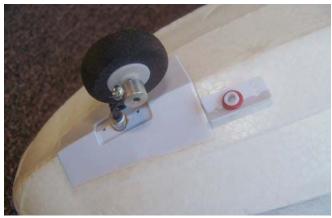
transmitter, and it easily binds with the installed Spektrum AR636/AS3X stabilizing receiver system, which is included with the BNF Basic package. Assembly doesn't take long, and the only other items you will need to complete the BHF Basic ICON is a 3S 2200mAh 30C LiPo and a balance charger. Two screws hold the stabilizer in place. Make sure that the elevator servo is centered first, then adjust the pushrod length and connect it to the elevator horn. Next, attach the landing gear (or the cover plates for off-water flying). The most difficult part of the assembly for me was installing the nose-wheel steering arm and pushrod. I used a small piece of masking tape to hold the steering arm

90 degrees to the steering pushrod. This made alignment a lot easier. Use a pair of tweezers or forceps to hold the small steering–arm retainer screw while installing it. Make sure that the arm is facing the left side of the fuselage (opposite of the rudder horn). With the rudder servo centered, adjust the nose–wheel pushrod so that the ICON rolls straight ahead.

Set up the radio and check the motorrotation direction before installing the propeller. Then, install the prop and spinner; when viewed from the rear, they should spin clockwise. Slide the composite wing tube through the fuselage, and install the wing panels. Be careful that the aileron leads don't get pinched between the



The main gear is made out of aluminum and is easy to install and remove, depending on where you want to fly your model.



Here, you see the nose gear in place. If you fly from water, you remove it and replace it with the cover shown with the red O-ring. This seals the opening and prevents water from entering the fuselage.

wing and the fuselage. Two #3 16mm screws are used to retain the wings. Set up the control throws and dual rates as recommended in the instructions and you're ready to go to the flying field or the lake.

IN THE AIR

I decided to make my first test flights from the paved runway of my club, the Sarasota R.C. Squadron. To test the model's inherent flight stability and performance, I flew it with the SAFE Select stabilization both active and disabled. Setting up the AS3X system requires the plane to be on a level surface. If you are using the wheels, this is no problem, but with the wheels removed for water operations, you have to use the included stand to support the model. With my Spektrum DX9, I used two channels for the ailerons, and programmed differential control for 5/8 inch up aileron travel and 3/8 inch down. While I was at it, I also added a 12% rudder mix to the ailerons. If you set up your model with the proper mixes, your turns will always look good. I also added 30% expo to both the elevator and ailerons to soften the control response near center.

GENERAL FLIGHT PERFORMANCE

Stability: With the SAFE Select system activated, the ICON was a great-flying, very stable performer. It took care of any wind effect, and it felt as if it were flying in calm conditions. With the system turned off (and the model balanced as instructed), the model felt as if it were a bit nose-heavy and required some up trim. To balance, I moved the battery back some 13/4 inches back from the leading edge.

Tracking: Ground handling was very good, and the model was easily held in a straight line



Two screws secure the T-tail stabilizer, and a servo in the vertical fin makes the elevator control linkage short and slop-free.



ICON A5: The Best of Both Worlds

If you are a pilot who flies full-size planes and are torn between a new sports car and a new airplane, don't worry—you may soon be able to have both (and a boat, too). Designed for the light sport market, the ICON is a beautiful two-piece, molded-composite, carbon-fiber amphibious aircraft that you just have to admire. This is not a new plane; it first flew in July 2008. Many years have been spent since that first flight to make the ICON A5 very resistant to stall and spin. In fact, being a light sport plane, it is designed to be easy for a nonpilot to learn to fly in a minimum of 20 hours. Sales and flight centers have opened in California and Florida, with another coming soon to Texas. This is a very exciting new airplane.

during the takeoff run.

Aerobatics: The 480-size motor offers enough power for any basic aerobatics and more. The higher-than-normal motor position and thrust line didn't cause much pitch-change coupling when you changed throttle settings. Roll rate was very good, and the model did nice, relatively straight rolls. Flying loops from level flight was no problem, and tracking was excellent throughout the loops. The rudder was plenty big for good yaw control. The model easily performed nice tall stall turns and other turnaround maneuvers, like a half-reverse Cuban-8.

Glide and stall performance: With power pulled back, the ICON had a mild stall but nothing to worry about. Depending on the wind direction, you might get a wingtip to drop off, but recoveries were very easy. The long efficient wing performed well at low speeds. Glide performance was also good as the model is very clean aerodynamically. But as with most scale airplanes, be sure not to slow the model down too much in steep turns. Keep the speed up a little and everything is great.

ON THE WATER

It takes only a few minutes to remove the landing gear and put the cover plates in place. Be sure to install the O-ring, which goes on the inside of the nose-wheel strut cover to seal

it. I made some taxi runs at different speeds and found that the model handles very well on the water. The air rudder is powerful enough to steer it in the light wind we had. Strong crosswinds could be a challenge, so, as with all seaplanes, take off and land into the wind. When landing in windy conditions after you touch down, maintain enough speed to keep the hull on plane and steer it with rudder like a boat back to shore. Use ailerons to keep the wings level.

PILOT DEBRIEFING

With the SAFE Select system disabled, I did find that, coming out of a loop at about a 30-degree descending angle, the model's tail would yaw back and forth, in sort of a Dutch roll. I felt that the balance was a little far forward, and moving the battery back some eliminated this. (This did not happen when the SAFE Select was active.) In general, I like a slightly rearward balance point as it eliminates the need for up trim and you don't run out of up-elevator on landings.

BOTTOM LINE

Flying from dry land or from offshore, the ICON A5 is a fun model. Though not a trainer, the ICON can be flown by any new RC pilot with the SAFE Select system activated. It has nice scale lines and styling, and its eye appeal can't be beat. Add to this very good flight performance and you have a winner. \pm

RealFlight-X Flight Simulator

SETTING A NEW STANDARD IN FLYING REALISM BY ANDREW GRIFFITH

Over the last several years, flight simulators have become as valuable a tool in an RC modeler's toolbox as a hobby knife, and RealFlight has always been on the leading edge of RC flight-simulator development. When I was learning how to fly helicopters, I could fly around and even do some aerobatics, but I couldn't hover nose-in nor did I have the guts to even try to flip it inverted. After a couple of sets of blades and new tail booms, I decided it was time to try something different.

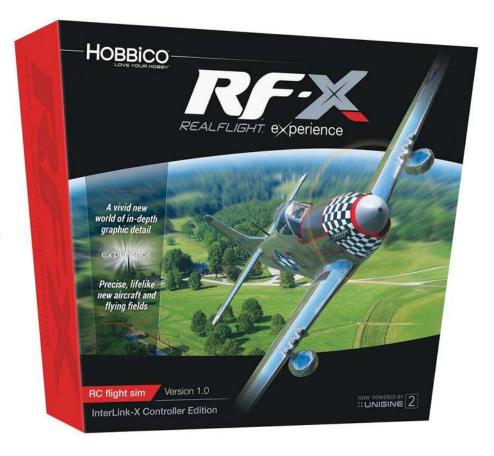
Learning how to hover nose-in and then inverted on the simulator was such a revelation for me that I started recommending incorporating simulator training with the students I was teaching to fly fixed wing. I noticed an immediate and dramatic drop in the time from first flight to solo by students that were using a computer-based flight simulator to supplement their training between flying sessions. Full-scale pilots have known this for years, of course, but at the time, simulators were just showing up on the RC market.

I have owned several versions of the RealFlight RC flight-simulator software and have played with just about all of them, so I can say with confidence that RealFlight-X represents a new standard in graphics and physics for an RC flight simulator. But pay careful attention to required computer-system specifications, particularly the video-memory requirement!

WHAT'S NEW

The full version of RF–X ships with an Interlink controller, the DVD, a set of cables to attach your own transmitter, and a smooth helicopterstyle replacement throttle ratchet. It's also available as a software–only version at a lower price.

RF–X isn't just a sequential upgrade; this is a ground–up rewrite of the code that affects both the graphics rendering and the flight physics. As someone that deals with software versions every day in my full–time job, I knew



that RealFlight rewrote the entire code when I noticed that the version number is now 1.0.x again. The company has also added a unique FPV module that simulates both aircraft and quadcopter first-person-view (FPV) flying and racing.

A new-style Interlink controller is provided, which is based on the popular Tactic transmitters. The Interlink controller plugs into a USB port, and the cables that are included allow the use of buddy-box-style connections like a regular RC transmitter. The Interlink not only provides the ever-popular "reset" button but also includes input and scroll buttons as well so that you can run most of the program menus without ever needing to touch your keyboard. In addition to restarting your current scenario, holding down the reset button allows you to rewind and start the flight over at the point at which you release the button.

The Interlink controller has also been

expanded to 10 channels and now features two side–mounted sliders. These are used for controlling cameras on the FPV rigs, but I'll be looking for a way to remap them to aircraft flaps; the one thing that always bugged me about RealFlight was using a dial on the flaps, which I never do on my planes.

The flying fields and aircraft have all been remastered in amazing detail. While the ability to import other models hasn't yet been introduced, there is something for everyone in the 60 models currently available: jets, gliders, helicopters, single and multiengine planes, and even a blimp.

Twelve flying sites are rendered in threedimensional high-definition wonder. It doesn't sound like a lot, but there's plenty of variety, including wide-open flying fields, a castle, and eight million acres of soaring in Sierra Nevada.

In addition to open flying, there's a convenient screen that lets you choose

Highlights

- → Outstanding new graphics and physics
- → Can be installed and run without a manual
- → Interlink controller included, along with cables for several radios
- → Task-based FPV module

Quick Specs

Model: RealFlight-X RC Flight Simulator (realflight.com)

Distributor: Hobbico (hobbico.com)

Type: PC-based computer flight simulator

Price: \$179.99

Minimum Recommended System

- → Windows 7, Windows 8, or Windows 10; 64 bit
- → Quad-core processor (AMD FX-4300 or equivalent)
- → DirectX 11 Mid-Range Video Card with 2GB of video memory (GTX 460 or better; integrated video cards not recommended)
- → 30GB hard-drive space
- → 4GB RAM
- → DVD drive

Optimal System

- → I7-6700 processor or equivalent
- → Nvidia GTX 1060, Radeon RX 480, or equivalent
- → 32GB RAM
- → SSD hard drive



As the giant-scale P-51 taxies out, you can see the sun glinting off the canopy and metal finish when you turn. A three-position switch closes the canopy and activates the smoke.



Here's the eight-motor Octo-Copter shown from the ground perspective. In addition to the flying views, you can switch your view to the onboard camera and control the gimbals with the side-mounted sliders on the transmitter.





My first FPV experience was years ago, trying to land a model using the cockpit view in Real Flight 3.0. Things have changed since then, and the incredible detail makes this an immersive experience.



Even if it's not practical to learn with, the wingtip view is neat and shows the amazing graphic detail if you have a card that will run the program at full resolution.

preconfigured scenarios. For example, say that you want to do some slope soaring. If you select that scenario, the sim loads up a highperformance glider as well as a slope soaring site, complete with the appropriate wind.

As of this writing, support for editing models, multiplayer, float flying, and my personal favorite, the V-22 Osprey, aren't available. I say "as of this writing" because a series of updates are planned that I'm told will bring some of these features back. The launch screen includes an updater that can be set to check for revisions each time the program is launched, so it's easy to make sure that you have the most current release. (Note: As I was writing this, a beta release was made available that brings back the aircraft editor, so the RealFlight team is busy doing these updates.)

COMPUTER STICK TIME

Whether using RealFlight-X as a tool or a game, one thing is certain: It is an immersive and accurate RC flight simulator. The provided Interlink controller is an excellent interface, but cables are provided to attach a variety of actual transmitters. Personally, I don't want the wear and tear of hours of simulator time on the gimbals and switches of my everyday flying radio. A simulator's most valuable asset is teaching muscle memory, and that can be accomplished perfectly with the provided Interlink controller.

Despite being limited to the provided aircraft (at this time), there is a plenty of variety to allow you to fly something representative of your favorite real-world models. You can pick a model and a field in an open-flying format or one of the prepackaged scenarios that have everything picked out for you. Once you have

TRAVEL THE WORLD: 12 FLYING SITES TO CHOOSE FROM





I've had a lot of crashes that looked like this, but unfortunately most of them required more than a reset button! I recommend that, during simulator training, you never give up and watch a model plow in; keep trying for the save. If you practice like you play, you will play like you practice.



Scenarios are a great way to choose an appropriate aircraft type and flying site with one click. Slope soaring, night flying with a heli, aerobatic practice—they're all configured with everything you need, including the appropriate weather.

a model and site loaded up, flying in the newly rendered 3D flying sites is both a rich and an entertaining experience.

A new feature of RealFlight-X—and one that I spent a lot of time playing with—is the FPV section. There are a series of tasks that you have to complete within specified times. Each task gets progressively more difficult, and each level must be mastered to unlock the tasks at the next, more advanced level. I'm also working on my first review, so I found this section of the sim to be particularly helpful. While I found it a bit humbling, I noticed that, after mastering several levels of the FPV challenges on the simulator, I found myself doing a lot better at the field.

BOTTOM LINE

Flight simulators are awesome in a number of ways. Want to try a jet? Load one up on the sim and give it a go—same with a 3D high-powered helicopter. Even with the initial investment, RealFlight is a cost-effective way to learn new RC ways of flying. Whether you're a new pilot trying to learn how to land without an instructor or an experienced pilot trying to learn to pop-top or harrier-roll your 3D plane in a low-risk environment, pilots of all skill levels will get something out of this simulator. The installation of RealFlight-X is simple if you have the required system specs to run the program. It's easy to get into the (virtual) air quickly, and the interface is intuitive and doesn't require any instructions. The graphics have to be seen on a good PC to be believed, with the shadowing, reflections, and depth of field giving RealFlight-X a visual appeal and realism that is a huge leap over previous versions. **±**



Flight Test

HOBBYKING Night Walrus

A great flier before and after the sun sets

BY LOU CETRANGELO
PHOTOS BY LOU CETRANGELO & SAL CALVAGNA

At our club field on Long Island, New York, we typically only fly airplanes with a wingspan of a minimum of 80 inches. After hours, however, while the sun is setting, out come the smaller foamies. The fun and challenge of chasing each other around is on. As the lighting conditions grow dimmer, things really get interesting as we try to keep our eyes on our airplanes. So when I saw the new Night Walrus from HobbyKing, a night-capable plane with built-in lights, I had to get it. I thought it would be really cool to be able to fly well past when everyone else was grounded.





SPECIFICATIONS

MODEL: Night Walrus
DISTRIBUTOR: HobbyKing
(hobbyking.com)
WINGSPAN: 55.13 in.
WING AREA: 304 sq. in.
WEIGHT: 30.5 oz.
WING LOADING: 14.45 oz./sq. ft.
LENGTH: 40.75 in.
RADIO REQ'D: 6-channel

MOTOR REQ'D: 1350Kv brushless PRICE: \$125.50

GEAR USED

RADJO: Spektrum DX18 w/ AR6110e 6-channel receiver (spektrumrc.com); six 9g servos (installed)

MOTOR: 2212 brushless outrunner 1350Kv and 30A speed control (installed) BATTERY: Turnigy 30C 3S 2200mAh LiPo (hobbyking.com)

PROPELLER: Folding (included)

HIGHLIGHTS

- **⇒** Good value
- Easy to fly
- Quick to assemble



UNIQUE FEATURES

The HobbyKing Night Walrus is a streamlined e-powered glider that comes complete with a folding propeller. It comes with everything installed including the speed control, a brushless motor, and a complete set of servos for flaps. All of the LED lights are installed, and a connector is provided that can be unplugged if you choose to fly with the LEDs off. The airplane is made out of durable molded EPO foam, and it has attractive graphic decals already in place.

Only minor assembly is required. The rudder and stabilizer need to be glued into place, and the main wings plug into the fuselage with a carbon-fiber spar. Install the control horns and attach the pushrods for all the control surfaces. The wings are attached with two screws and are removable, though the plane is small enough fully assembled to easily fit in the back of my SUV. It is recommended to use a 3S 2200mAh LiPo for power; I purchased a few from HobbyKing with EC3 connectors for compatibility with some of my other foamies, so I changed the connector on the speed control to match. I installed the battery with a Velcro strip on the floor of the cockpit, and have the speed control double-stick-taped on one side of the fuselage with my small Spektrum receiver on the other. I used two 1/4-inch strips of Velcro on the bottom of the battery for easy removal. It is necessary to route the servo wires from the receiver as far to the rear as possible so that there is room for the battery. The instruction manual shows the recommended location of the center of gravity (CG) and also shows where the battery should be positioned. This works out very well as the CG was right on with no extra weight needed.

IN THE AIR

For test flights, I used my DX18 transmitter, and after setting up the model, flying it for the first time was fairly easy. I had a buddy toss it in the wind as I went full power on the throttle. It leapt out of his hands and had no lack of power. I quickly reduced the throttle to half and proceeded to trim the ailerons. Mine needed a fair amount of left trim. Everything else was left at neutral.

Stability: With the battery properly installed, the Night Walrus is a stable flier and very easy to control.

Tracking: Being a powered glider with a long tail moment, the model tracks steadily and with very little wandering. With turns, however, adding a little rudder helps keep it on track.

Aerobatics: A factor of how much power is available, the Night Walrus can do all the basic aerobatic maneuvers as it has ailerons and rudder. So you can loop from level flight and even fly inverted. Rolls are smooth, and you can increase roll rate with a bit of rudder added.





Above: Remove the canopy and you have access to the battery for quick changes.

Left: The aileron servos have stick-on covers to improve the model's looks and clean up the servo installation a bit.



Left: All of the control linkages come installed and only need to be connected to the control horns.

Below: The propeller that comes with the model folds when the motor is not running. This improves glide performance.







Overall, the model performs nicely and does not feel overly sensitive.

Glide and stall performance: With flaps down and the power low, it will float along very slowly. Glide performance is excellent, and it has a clean, predictable stall. With flaps extended, you can come in for landings at a steep angle without building up too much airspeed. I set up the flaps using a three-position switch. Because the plane wants to dive when flaps are down, I ended up with a 20% mix for up-elevator at half flap and 30% up for full flaps. I also slowed the flap servos so that it takes three seconds for them to fully deploy. Set up this way, there is no trim change with the flaps up or down, and it is a pleasure to fly.

PILOT DEBRIEFING

The model is easy to control, and with the folding prop, it glides very nicely. It flies slowly at quarter throttle but has nearly unlimited vertical at full power. On takeoff, it only needs a light toss at an up angle with max power and it is safely away. Landings on grass are a piece of cake. The prop folds as soon as the motor stops, and it is completely out of the way during touchdowns.

BOTTOM LINE

The Night Walrus is a great plug-and-play model, needing only a small 6-channel receiver and a LiPo battery pack to complete. If you're looking to extend your flying time and want to try flight after the sun goes down, the Night Walrus is a good choice. It flies great and looks good doing it. I am sure you will like it. \pm

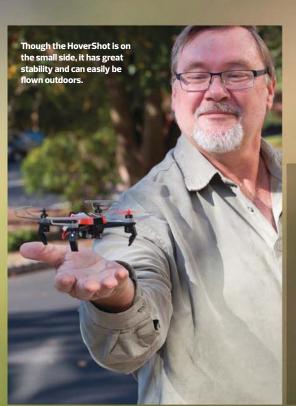
Flight Test

DROMIDA HoverShot

A mini FPV camera drone

BY GERRY YARRISH PHOTOS BY PETER HALL

Camera drones are all the rage today, and the hobby is getting easier and easier for the beginner to be successful. Not too long ago, you needed to pick and choose compatible equipment that would work properly together, but today there are a lot of drones ready to go without any additional equipment needed. One of these is the new the HoverShot FPV 120mm camera drone from Dromida, and it really is a blast to fly. And best of all, it comes with everything you need to get this little ready-to-fly (RTF) quadcopter into the air and is priced at less than \$100. Let's take an up-close look at what's in the box.



SPECIFICATIONS

MODEL: HoverShot
TYPE: FPV camera drone
MANUFACTURER: Dromida (dromida.com)
DISTRIBUTOR: Hobbico (hobbico.com)
SIZE: 120mm
DIAGONAL DIAMETER: 8 in.
WEIGHT: 2.5 oz.
POWER INCL'D: 3.7V 1S 650mAh LiPo
RADIO INCL'D: MR101 2.4GHZ
PRICE: \$99.99

GEAR USED

RADIO: MR101 2.4GHz transmitter (included)
BATTERY: Dromida 3.7V 1S 650mAh 20C LiPo (included)
CHARGER: USB-powered, 1S charger (included)
CAMERA: FPV camera (installed), with included 2GB micro memory card

HIGHLIGHTS

- Rugged construction
- Stable flight performance
- Included FPV camera and 2GB micro memory card



UNIQUE FEATURES

First of all, the HoverShot comes with a built-in 720p FPV (first-person-view) camera for in-flight still pictures and video footage. The transmitter has camera control buttons for Start, Stop, and Pause functions, and after takeoff, a built-in Altitude Hold feature helps the HoverShot maintain a stable hover for good-quality aerial photography. A built-in safety feature is the Motor Start/Stop button, which must be engaged before you can fly. Also an Auto Flip button adds some excitement, while push-button automatic takeoffs and landings make flying the HoverShot a piece of cake, even if you've never flown a quadcopter before.

The transmitter is equipped with digital trims, making it easy to dial for smooth control response. It also features a universal mobile—phone holder, two flight modes, and the separate camera and video buttons mentioned above. The transmitter is equipped with dual rates, and you can switch from High to Low rate settings by depressing the right stick downward until you hear a click. You can also adjust the sensitivity of the dual rates manually.

The RTF package is rounded out with a 1S 650mAh LiPo battery with a USB charger, four transmitter AAA batteries, a 2GB micro memory card, four extra blades, basic instructions, and a screwdriver. High-intensity LED lights aid in orientation and tracking, making it



Below: The built-in camera is controlled with transmitter buttons and a touchscreen, using the downloadable app. The lens can be manually adjusted for view angle.







The HoverShot comes with propeller guards attached. The props are

easy to replace.

easier to control and hover the HoverShot even at an extended distance. The quality of the video and photos is very good, and the included micro memory card makes downloading the files easy with a micro SD card adapter (not included).

IN THE AIR

Whether it is set at High or Low rates, the HoverShot is extremely stable and easy to hover, even outside in slightly breezy conditions. Flying indoors, it is rock solid, and I was quickly flying over the heads of my fellow Air Age Media/RotorDrone magazine editors, zipping through the break room with ease. To get the HoverShot airborne, press the Motor Start/ Stop button to activate the motors. Next, press the Auto Takeoff/Land button and the drone will liftoff to about a 3-foot altitude. If you don't move the throttle stick, the built-in Altitude Hold function will try to maintain the same altitude. You can also take off using the throttle stick. After the motors are running, advance the throttle slowly until the HoverShot lifts off; once it is at the altitude you want, release the stick and again the Altitude Hold will work to maintain

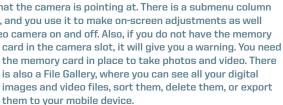
Getting Connected

Downloading the free DroneView camera control app is easy from the Google Play Store or the App Store; if you do this while you are connected to Wi-Fi, it takes only a minute or two. To connect the app to the camera, first go to your device's Settings page and select the Wi-Fi submenu. Look down until you see the DroneView Wi-Fi network and select it. Exit the settings page, and launch the DroneView app. It will take a few seconds to connect and then you

will see the screen showing what the camera is pointing at. There is a submenu column on the right side of the screen, and you use it to make on-screen adjustments as well as take photos or turn the video camera on and off. Also, if you do not have the memory

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Above: This is the Settings page, with the DroneView Wi-Fi network selected. Right: This is the connected view for the camera, and the submenu column is shown



The Dromida XL's transmitter

has a mobile phone-holding fixture

attached to the top of the case.



altitude. Pressing the Auto Takeoff/Land button while airborne will cause the drone to descend slowly, and once on the ground, the motors will shut off. Should you lose control and the drone is about to crash, press the Motor Start/Stop button to prevent damage to the propellers or motors.

GENERAL FLIGHT PERFORMANCE

Stability: As with all Dromida drones, the HoverShot, even though it does not feature GPS tracking, is very stable, and it does a great job staying where you want it.

Aerobatics: The transmitter is equipped with an Auto Flip function. To do this, climb to a safe altitude (about 25 to 30 feet), and enter a stable hover. Press the left (throttle) stick downward until you hear a beep, then move the right stick in the direction you want the drone to flip. Return the stick to neutral and the drone will flip in that direction.

PILOT DEBRIEFING

Overall, the new HoverShot FPV Camera Drone is a winner in both stability and the quality of the airborne photography it offers. I think anyone wanting to get an easy-to-fly camera-equipped quadcopter will love it.

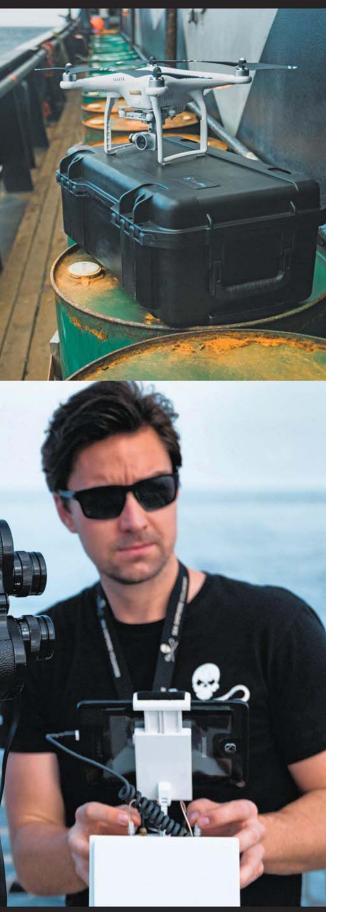
BOTTOM LINE

The Dromida HoverShot FPV camera drone is a great little quadcopter to fly. It is stable enough for less-experienced pilots to be successful right away, and it has plenty of zip on tap for experienced pilots to enjoy. Couple all this with a street price of less than \$100 and it becomes a great value. Give it a try; I know you'll be glad you did. 🛨









DRONE PILOTING: NOT A ONE-PERSON JOB

Shooting moving objects from a distance is a challenge for even the most skilled pilots. There are some approaches to drone flying that can come in handy in situations like these. When I know that I'm going to encounter a situation like this, the first thing I do is brainstorm a handful of shot ideas that will help craft the story. Doing this can help ease the pressure of shooting once-in-alifetime events and can help facilitate communication with any assistants or observers that might be helping you. On this particular day, our mission was to shoot footage of a pair of blue whales while maintaining a safe distance. We'd later find out that this flight would deliver the first-ever aerial footage of a blue whale mother and her calf and some of the only footage-ever-of a blue whale calf nursing.

Locating a pair of migrating endangered whales from the air is extremely difficult. It's one thing to be able to spot a subject at a distance, but it's another to place an unmanned aerial vehicle (UAV) on it from a platform that's moving in a different direction over a mile away. I knew going in that I was going to need the help of my spotter to help pinpoint our target. From past flights, I'd learned that it's all but impossible to judge a UAV's proximity to another object once it gets more than a couple hundred feet away, especially when trying to flip in and out of first-personview goggles. Having someone who can keep an eye on the aircraft at all times and who can help give you location information and navigate is absolutely essential for tackling a shot like this one. When you're at sea, your location is constantly changing, even if your ship isn't underway. Your elevation above the water also makes a big difference for flying, navigating, and maintaining signal robustness. When we flew from the small boat, the boat would often drift in circles, which made keeping orientation to the drone all the more difficult.

With the help of my spotter, I was able to align the Phantom 3 on the same relative bearing as the whales and headed off on an intercept course. Whales are virtually impossible to see when they're underwater because humans and whales are more or less on the same plane, so once the UAV was in the vicinity of the whales, we had to wait until they came up again to confirm their location. When they next breached, I was able to locate them on my video screen via the spray from their spouts—and from that point on, I flew through the UAV's point of view

while periodically checking my line of sight on the aircraft. I don't like to let too much time go by without a visual check of the aircraft, even when I have a spotter—it's just one of those things.

As a rule, I always fly with at least one spotter; it's helpful for a variety of reasons, especially recovery. Once the cetaceans were in visual range, it was just a matter of carrying out the shots we had planned for, while keeping a safe operating distance. Before takeoff, there are a number of things you can do to ensure that you'll get the best shots possible with your drone.

SHOT SELECTION

My favorite way to brainstorm ideas for capturing visually stunning aerial cinematography is to watch actionpacked film and television shows that feature vehicles, like ships or cars. In some ways, filming a whale is not unlike photographing a fast-moving ship or submarine—the same rules apply. I've drawn a lot of inspiration recently from the TNT program The Last Ship, among others. The show amplifies a lot of the action with dynamic shots of the USS Nathan James, an Arleigh Burke class destroyer. The film projects of Michael Bay and movies like *U-571* also have a lot of great aerial cinematography that can be inspirational. You'll soon notice that the catalog of shots isn't too big; as with car commercials, you'll tend to see the same shots repeated again and again. Cinematographers tend to pick from a handful of tried-and-true shots that deliver the most bang per frame. For example, you'll often see the same shot—or slight variations of it—repeated in *The Last Ship* several times per episode, but it's not due to lack of creativity. Some of these shots just look really, really cool; they're part of our learned visual grammar, and they tell the story.

Let's look at a few shot progressions from The Last Ship to give you an idea of what they look like in practice. This first one is identical to one of my blue whale shots, a fairly common shot in aerial cinematography. You approach a subject while ascending the aircraft and tilting down on the camera—a fairly complex series of inputs for a single operator but, like anything, ones that can be finessed with a bit of practice. I sometimes obsess over getting a subject perfectly centered or fixing the horizon if it's tilted. Once you review enough footage, you'll notice that it's never perfect, even in multimillion-dollar productions, so cut yourself some slack if you're not getting it exactly right.

AVOIDING ELECTRONIC INTERFERENCE

I find that, wherever I fly (with the exception of a remote mountain peak that I once visited), there tends to be enough electronic interference around to deteriorate or cause a complete loss of the remote control and video feed signals from the UAV. Knowing this, I equip some of my transmitters with an external antenna, which helps not only create a more robust signal but also maintain a signal at a farther distance than the stock one allows, especially when the aircraft's antenna is not facing your ground station. There's a lot of science that goes into antenna selection, which I won't get into here; suffice it to say that I've been happy with the panel-style antennae from DBS Mods in Florida.

Of particular concern to me while flying on the open ocean is signal loss; if the auto return-to-home function is triggered after signal loss and I fail to regain control of the UAV, it's likely that it will land itself in the water. Likewise, if I lose the video feed or telemetry midflight, returning to the ship could be problematic as orienting the aircraft at a distance by eye is sometimes difficult—if not impossible—especially if there's not a spotter on that particular flight. Another way to help your aircraft stay operational is to keep it away from large metal objects. Large pieces of metal can interfere with the UAV's sensors, especially its compass. Being on a ship, of course, we were surrounded by nothing but metal. To get around this, we always hand-launch and hand-catch our UAVs while at sea. If they initialize or land on the metal decks of the ship, they can get incorrect navigational data and fail to operate properly. The sensors inside the Phantom 3 also won't allow for takeoff if there's too much motion detected; when hand launching your drone, your arms can act as a kind of gimbal to insulate the drone from outside motion.

CONTROLLING LIGHT

It was about midday when we encountered the whales, so going in, I knew the sun was going to wreak havoc with reflections off the waterbright reflections can ruin images. In this case, I used the polarizer from PolarPro filter, which has become a popular accessory for the DJI Phantom. Before takeoff, I installed a polarizing filter over the lens as polarizers help reduce or eliminate reflections and glare off the water. In this case, I hoped that the polarizer would enable the onboard camera to be able to see the subjects. The important thing to remember about using polarizers on UAVs is that you have to orient their angle before takeoff; changing it once you're in the air is impossible, and a misaligned polarizer can ruin your shot. PolarPro, among others, is now offering combined polarizer and neutral-density filters, so you can get your polarization while also getting light reduction—a win-win situation, especially in bright daytime environments like the one I was operating in. Also remember



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Brian Race, Gavin Garrison, Alistair Allen, and Ashleigh Allam monitor a DJI Phantom 3 midflight from the deck of the MY Steve Irwin. A 7-inch Ikan monitor is connected via HDMI to the Phantom transmitter, which is modified with the DBS Mods antenna. (Photo courtesy of Sea Shepherd)

to keep the sun in the correct position, as I discuss below. Another consideration are the nav lights on the UAV; I often turn off and tape off (above) any light coming from the UAV so that the bright LEDs don't cause a flare or haze in the camera. In environments where moisture can collect on the lens, a bright LED can ruin your shot.

MAKE THE MOST OF YOUR WINDOW

We knew that the amount of time we would have eyes on the whales was limited; they had already been in visual range for about 10 minutes—generally, these sightings don't last long. Knowing that I wouldn't have much time to cover them, having a rough outline of the shots we wanted in advance was crucial. My first priority was to make sure the wide approaching shot was usable. Once I was in position, I aimed to track slowly with the whales without any noticeable movement from the camera or aircraft so that viewers would feel as if they were there, floating along with the whales in the vast emptiness of the ocean. Jarring movements from the camera or aircraft could threaten to ruin the magic of the experience.

On the final approach to the pair, I began to tilt the camera down so that, by the time the aircraft arrived near the whales, the camera would ease into a downward–facing position and keep them perfectly framed, like the above–referenced shot from *The Last Ship*. From there, I reoriented myself so that the sun was behind the camera and eased into a position that allowed me to continue to track with them as they moved forward. As a happy coincidence, because of the time of day and angle of the sun, when the mother whale exhaled before her final dive out of view, her spray caught the light and created a perfect rainbow.

After that moment, both whales dove, and I kept the UAV tracking with their faint outlines as they dove deeper into the ocean. One important thing to remember, especially with aerial shots, is to hold your shot for a few beats after you think

I AIMED TO TRACK SLOWLY WITH THE WHALES WITHOUT ANY NOTICEABLE MOVEMENT FROM THE CAMERA SO THAT VIEWERS WOULD FEEL AS IF THEY WERE THERE, FLOATING ALONG WITH THE WHALES IN THE VAST EMPTINESS OF THE OCEAN.



they're over. When we reviewed the footage later, we realized that you could actually still see the whales for quite a while, even under the water. It was pretty cool to see them slowly dive out of view; you never know when a few extra seconds after the action might help craft your story.

RESPECT THE ENVIRONMENT-AND THE LAW

One of the important things to know when documenting whales or other large aquatic animals is that you should never—whether you're in an aircraft, on a boat, or flying a UAV—approach them from their direction of travel (i.e., don't get out ahead of them). It's believed that approaching from the front could interfere with or otherwise affect their movement, which is a big no-no. Coming from the United States, we're used to rapidly changing civilian drone regulations; there are entirely separate sets of regulations that protect wildlife.

In August 2015, two drone pilots made headlines when they were fined \$1,000 for flying too close to orcas in Washington State; the local regulation is to prohibit flying at a distance less than 600 feet away. The Australian government maintains a 1,650-foot no-fly zone around protected wildlife for manned helicopters, although it has not yet introduced any formal regulations for UAVs; the Australian Antarctic Division has an extensive permit process that's required for all aircraft, manned or unmanned. And the National Oceanic and Atmospheric Administration (NOAA) demands that UAVs provide a 1,500-foot right-of-way for our cetacean friends; NOAA requires 1,000 feet for manned aircraft. Drone technology is enabling organizations like ours to completely revolutionize our approach to conservation, helping us gather stunning images that we can share with the world. Wherever you are—from the high seas to the high plains—as a drone pilot, you're tasked with helping build a global community of aerial cinematographers that creates amazing imagery and shared experiences that benefit us all. ‡

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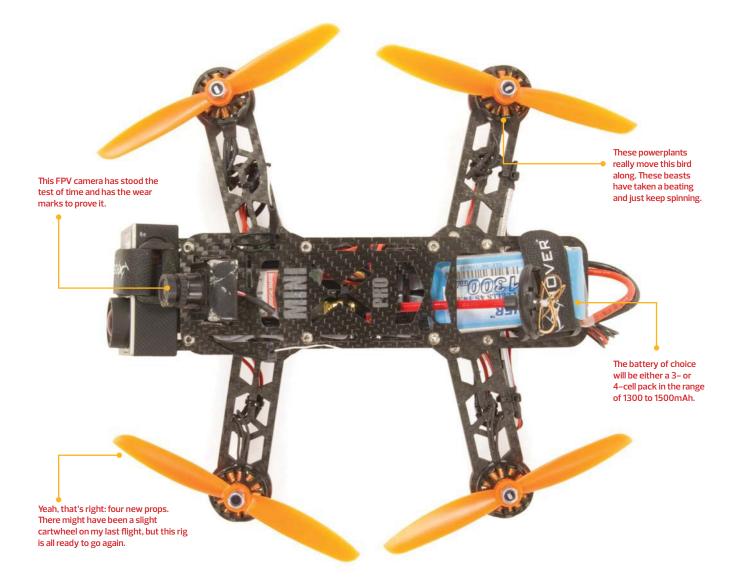






Get in the pilot's seat with drone racing

One of the fastest-growing segments in the multirotor world is drone racing. Across the country, racing quads are flying off the shelf and selling out as fast as they come in. Throughout the globe, pilots gather on the weekends and set up makeshift courses to compete against each other, while other pilots challenge each other to obstacle courses to see who can fit a quad through the smallest opening in the fastest time. You can enjoy the same racing views that pilots experience just by thumbing through any of the hundreds of first-person-view (FPV) racing videos on YouTube. If you want to be a part of this experience, read on to see what it takes to fly one of these fast little quads.



WHAT IS DRONE RACING?

Drone racing is flying an aircraft by viewing the flight from the aircraft itself. Full–size aircraft do this all the time because the pilot is actually sitting in the cockpit of the aircraft. Because of the size of our racers, we have to use a system in which an onboard camera sends video instantaneously to an onboard transmitter, which, in turn, transmits a video signal to a receiver on a monitor or in FPV goggles that the pilot views to navigate the aircraft.

Drone racing can be done with any remote-controlled aircraft, such as helicopters, planes, cars, or (as in this case) quadcopters. The most popular racing quads are 250mm in size because they are fast, durable, and relatively inexpensive. These small quads can take a good hit; even after cartwheeling along the ground, they are good to go for the next heat once you replace a few props.

Believe me when I say that having a durable quad is almost a requirement when learning to fly FPV. When you first start out, two things will happen: You will crash a lot, and you will go through a lot of props. But from the first flight, you also will be totally addicted to this sport. Let's look at some of the equipment that you will need to get up in the air.

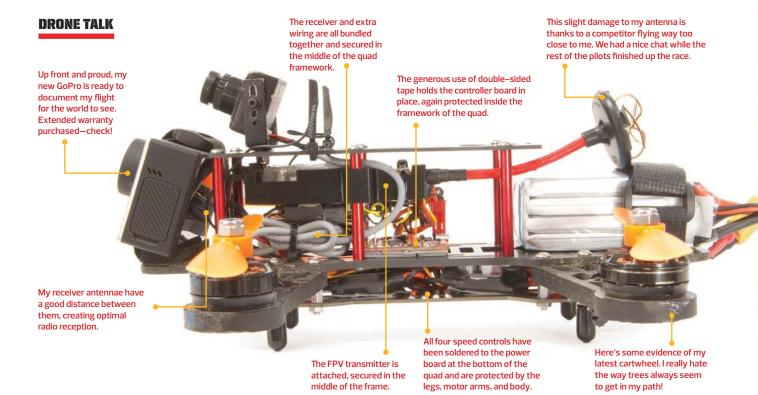
THE BASICS

 $\label{eq:Quads.} \begin{tabular}{ll} Quads. The first requirement is the quadcopter; you need a racing machine, and a 250mm-size bird is just the ticket. As mentioned, it can take a good hit and keep on racing (with a new prop or two). There are a number of different brands and type of quads that fit in this category, with prices that range from $15 all the way up to $300. Get the best one you can afford; quality does count, and for $100-$200, you'll get a thick carbon-fiber frame that can stand up to FPV racing. In addition, the frame will protect all of the internal parts, which may easily cost more than even the frame itself. Plastic or thin carbon-fiber frames will shatter when they hit something (trees do always seem to get in the way), and once that frame goes, all the internal parts will tend to follow in the destruction.$

Thick booms/arms are also essential on a good 250mm–size quad as they offer some protection to the motors hanging out on the ends. One common occurrence when you're first learning to fly FPV is getting the quad too low to the ground at full speed. This will produce some spectacular cartwheeling as the bird rapidly slows down, and quads with thick arms tend to fare very well when the rotation stops. Get a good quad and you'll be more likely to keep flying even after a spectacular crash.

Radio. You can use any radio brand you prefer; the minimum requirement is four channels, but six are better as they allow you to program in flight modes. Many pilots will fly without any assistance from GPS but still use some automatic stabilization. This allows the quad to be very maneuverable and to hold the heading it is put into. Once pushed into forward flight, the quad maintains that angle, so the pilot has to concentrate only on guiding it through the racecourse and navigating through small openings.

SBus systems work well here because they only require a one–wire connection between the receiver and flight controller. Because you have only the one connection, you will want a good–quality servo extension for this task. Weight is always a consideration here, so be sure to use the smallest receiver possible to save on weight and maximize your speed.



FPV SYSTEMS

Eyes! FPV equipment consists of a small video camera mounted to the front of the aircraft. There are a number of brands to choose from—and any of them will work—but the key is to get one with as wide a view as possible without distortion. This is the view that you will use to guide your quad around the course. Many racing

Lumenie²

The camera is the key to FPV racing, giving the pilot the view from the front of the quad.



Here's the business end of the quad. The motors work together to drive the quad through the air at some really fast speeds.

quad designs protect this camera, so a larger investment in this piece of equipment would be wise.

Transmission sent. The FPV camera is plugged into a transmitter that relays the video information in real time to a ground station, which the pilot monitors. The ImmersionRC



The video transmitter (blue) will transmit the video signal on different channels so that more than one pilot can be in the air at the same time.



The radio receiver for control of the quad can be very small—a good example is the Spektrum FPV Racing Serial Receiver.

25 to 200MW 5.8GHz transmitters seem to be a popular choice with FPV racers. Some racers will add a circular or mushroom antenna to make sure that the signal is continuous and strong. A semiflexible antenna is a good addition in case it is bumped as it will flex instead of breaking off.

Ground control, transmission received! Once your quad has sent out a visual transmission that you'll use to guide it through the very small obstacles, all you have to do is receive it. For most pilots, this is accomplished with FPV goggles, which receive the video signal through their own antenna and convert it to a video that plays on two small screens in front of your eyes. Goggles also block out all external light and help make it easier for pilots to direct all of their attention to flying the multirotor. Here again a better-quality set of goggles will improve your vision and make it easier for you to guide your multirotor through the course; one of the most popular brands among FPV pilots is Fat Shark.

The second option is a small to midsize monitor that allows you to see what the camera is transmitting. Some pilots prefer this method—especially if FPV goggles make them dizzy. Another good investment is a sunshade for the screen to prevent any extraneous light from coming in and interfering with the image quality. The disadvantage of using a screen is that you don't get that feeling of total immersion like you do when using goggles. The advantage is that you can look up in the air at the multirotor and guide it in visually, rather than digitally, for a landing.



FLIGHT TIPS

Learning to fly a quad. As they say, you have to crawl before you can walk, and you have to walk before you can run. FPV racing is definitely running—and at full speed—so if you have never flown a quad before, start out with a smaller quad that you can fly around the house. This way, you can learn how to control it and even how to fly it under and through obstacles.

When you are ready to move onto your racing quad, any 250mm-size model will work. Fly it around in an open field, getting a feel for the controls, speeding, hovering, and overall general sense of the machine. When you feel really comfortable, open it up and travel at the fastest forward speed possible. This will be your normal racing posture, so get used to the speed and angle of the quad. Make quick corners, and see what controls are needed to make sharp turns and then master them. You are now ready for FPV flying.

Learning to fly using FPV goggles. When you first start flying with FPV goggles, be prepared to be really frustrated because it will feel like you just started flying all over again. Daniel Sandova, expert FPV pilot and owner of XHover, says that when he first started flying FPV two years ago in his backyard, he was ready to sell everything after his first flight, but now he is one of the top pilots. He recommends that you start by hovering without the goggles on so that you'll learn how high the actual quad is, and compare that to what you see with the goggles on. Your perspective will be off at first, but after a few flights, you will get the hang of it.

One of the best learning tools is to have a calm person (emphasis on calm!) stand next to you and tell you just how high you are flying. This really worked for me as it allowed me to understand that what I was seeing through the goggles was much different than what was actually happening. After about 10 flights,

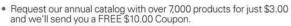
I started to feel comfortable and was able to navigate around the field, flying figure–8s without any assistance from my spotter. The key point here is to keep at it, and you will eventually learn how to handle your quad through FPV like an expert.

WHERE DO YOU GO FROM HERE?

FPV racing at this time is mainly a grassroots type of organization. Races are generally organized by a group of people who get together on the weekend and start flying. But it is starting to become mainstream and even appear on TV. Check with local clubs and quad groups in your area.

Next month, we will talk about some speed secrets for drone racing. ±

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Giant scale airplanes—specifically, big warbirds—have airframes made from aluminum formers and formed external panels and skins that give them their aerodynamic shape. Designed for speed and strength, the best way I can describe their shapes is "flowing." Whether it's a scale P-51D Mustang, a P-40 Warhawk, or (in this case) a Douglas A-1H Skyraider, when you build one of these models, you are going to have to sheet the fuselage. This article highlights some of the basic techniques you'll need to use to get the fuselage shape right. Let's get started.

BEFORE WE BEGIN

You start any sheeting project with sheets of balsa as well as a sharp hobby knife (with plenty of replacement blades). Most plans-built airplanes today are built with a short kit, which includes all of the major parts cut out, like the formers and ribs. For my project, I'm using a short kit from LaserCut USA (lasercutusa.com), but you'll also need to purchase the wood stringers, spars, longerons, and sheeting to complete the model. I purchased all of these from Balsa USA (balsausa.com). Complete kits, of course, include all of the wood as well as the sheeting. But here, too, you should check the hardness or stiffness of the wood supplied for sheeting. For my Skyraider, I bought medium—to light—grain, 1/8—inch balsa in 4—inch widths, with 36— and 48—inch lengths. Though much of the Skyraider's shape is flat and smooth, there are curved sections, especially at the tail, turtle deck, and firewall, that require bending the sheeting into place. Stiff or hard—grain balsa will split, even if you wet it beforehand. Also, it's heavier.

As far as supplies go, you will need several sheets of 100-, 220-, and

320-grit sandpaper; sanding bars; and a good metal straightedge. You'll also need glue and filler (I prefer Dap vinyl spackling, often referred to at the hardware store as "sheetrock mud"). For glue, I use both Zap CA (medium and thick) and Kicker and Titebond yellow wood glue (Zapglue.com). You'll also need a fair collection of modeling T-pins and clothespins for clamping edges down.



Sandpaper, Zap glue, yellow wood glue, and vinyl spackling are the main supplies you will need. You'll also need masking tape and lots of modeler's T-pins to sheet your fuselage.

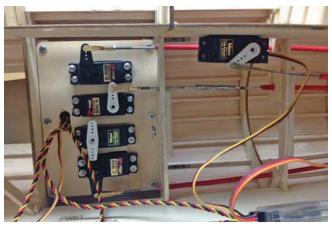


PREPARATION

To get a smooth and flowing surface, you first have to build a straight and true airframe. Take your time assembling the framework that will be under your sheeting. Install all the stringers and longerons so that they fit flush in their slots. Work on both sides of the fuselage, adding one or two to the right side and then one or two to the left. This way, you avoid building in stresses that can force the structure out of true.



A very important thing you'll need to do before starting is to true the long edges of your sheeting. Almost all balsa sheets have a slight curve in their length and their edges are not truly straight. To correct this, I use a straightedge and cut a small amount of the edge away to true the sheet. If you don't do this, you'll end up with excessive gaps in between the sheeting sections.



I also find it easier to install all the servos and the control linkages and pushrods before completing the fuselage. This way, you can reach between formers and stringers, and get to the hardware and install reinforcements in the proper areas.



When it comes to installing the pushrods, I use Gold N Rod from Sullivan (sullivanproducts.com), which is much easier to run to the exit points before the tail is all covered up. Run the guide tubes into place and leave them extra long.



Run full-length 4–40 steel pushrods through the guide tubes, and connect them to the control horns for the rudder and elevators. Then, connect the linkages to the servos and check for any binding. Once this is all done, glue the guides into place, then remove the hardware so that you can begin sheeting.



APPLYING THE SHEETING

Go over the entire fuselage and check for any loose or cracked stringers and reglue them into place. Then, take a sanding bar with 100-grit sandpaper and lightly sand over all the stringers and former junctions. You want to remove any high spots, glue lumps, or misaligned structures. The formers, stringers, and doublers should all be smooth and flush with each other so that the sheeting can lay down cleanly.

I prefer to start at the front around the cockpit area. Measure the distance between formers so that the sheeting pieces can be glued in place, supported at their ends by the formers. After they are cut to length, use a mixture of water and ammonia (I use a pump bottle of Windex) and lightly spritz the outside of the sheeting. Use some masking tape to hold the sheeting tightly in place until it is dry. This will form the wood to the compound-curved shape of the structure. Apply some Titebond glue to the underlying structure, then tape and pin the sheeting in place. The glue will dry in a couple of hours.

Once the first piece is done, add the next piece of sheeting, applying glue to the matching edges. Make sure to form a tight seam between the sections of sheeting. If you have to, trim the edges so that they fit nicely together, then pin the new sheeting into place.



Here, you see the ends of the sheeting glued in place and supported by the formers. You want to stagger the ends of the sheeting, as shown. To protect the soft balsa sheeting, be sure to use a foam building stand to hold the fuselage up off of the work surface. Any dings and dents will have to be filled later, so keep them to a minimum.

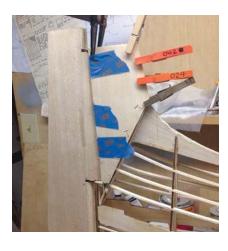


On either side of the cockpit opening, install light-plywood doublers to support the sheeting edges. These need to be flush with the formers that the sheeting is glued to. Work slowly and sand the glue joints smooth and flush.



When it comes to sheeting sharply curved areas like the instrument panel hood, use two layers of 1/16-inch sheeting, as shown here. Even the softest 1/8-inch balsa will crack if you bend it too sharply (yes, even when wet). I use Zap in these smaller sections, as I can hold the sheeting in place and hit it with a little kicker. Before applying the second layer, sand any glue buildup flush with the first layer.

While the sheeting on the front of the fuselage is pinned in place and drying, you can move to the tail. With the Skyraider, the vertical fin is built into the fuselage structure, so it is relatively easy to add the single left- and right-side sheeting pieces. Notice that the rudder is still in place to help support the rudder post.



Cut the sheeting to shape, then glue, pin, and tape it in place. It is relatively flat, so the balsa does not have to be wetted before application. Cut the piece slightly oversize, and use clothespins to clamp it in place against the leading edge. Once the glue dries, trim the leading edge and glue on the other side. Notice also that the lower edge is glued to an angled former, to support the sheeting and help blend it into the rest of the fuselage shape.

Here, the next piece of sheeting has been glued into place. I call it the heel piece, as it goes on over the keel that defines the vertical fin's shape. Again it is cut to shape and glued to formers at either end. The grain runs parallel to the keel piece.



Before continuing with the side sheeting, I install the tailwheel unit as well as its actuation pushrod and pull-pull steering system. Because this area is close to the ground, I install thin plywood on either side of the wheel-well opening instead of balsa sheeting. I also glue the bottom sheeting forward of the wheel well in place cross-grain to help stiffen the belly. The edges must be sanded flush with the lower longerons before the rest of the side sheeting can be glued into place.





While the tail–section sheeting is drying, go back to the front of the fuselage and continue sheeting the sides. Start at the second former, as the sheeting forward of it tapers and is sheeted with separate pieces. Again, use pins, tape, and clothespins to hold the sheeting in place while the Titebond yellow wood glue dries.

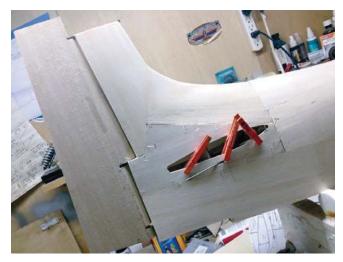


Returning to the tail section, the sheeting between the lower and uppers areas needs to be filled in with smaller sections of sheeting. Here, you see the area around the horizontal stabilizer being fit into place. An easy way to determine its shape is to cover the open area with printer paper, then use a pencil to define the needed shape. Use the paper as a template and cut the balsa to shape.

Back to the top of the fuselage, the section between the heel and the back edge of the top forward sheeting is the most severely curved part of the sheeting. To do this section, again I used two layers of 1/16-inch balsa sheeting. The first layer should be applied in two sections (left and right), with the seam running along the top stringer. The second layer, however, should be applied in three wedge-shaped pieces. The center piece should have its pointed end at the rear and its wide end butting against the top forward sheeting; this eliminates extremely sharp bends in the sheeting. The two side pieces should then be glued in place as shown, completing the overall section.



Here, the piece has been cut to shape, the opening for the horizontal stabilizer has been rough-cut, and the part has been pinned and clamped into place so that the glue can dry.



Here the sheeting has been glued into place and sanded flush with the rest of the surrounding areas. Minor gaps will be filled later.





Back to the front of the fuselage—here, you see the tapered sheeting glued in place, defining the exhaust ramps that are a distinctive feature of the Skyraider. All of these pieces are glued in place with Zap CA.



With all the sheeting glued in place, it's time to sand. I use a Great Planes Sanding Bar (greatplanes.com) with 100-grit sandpaper. Go over all of the sheeting, sanding all the edges down so that the entire fuselage is smooth and all the sheeting is flush and even. This will go very quickly, so after you hit all the high spots, switch to 220-grit paper and sand again. Notice that the sanding bar is at an angle to the fuselage's centerline. To avoid forming flat spots, roll the bar from front to back as you sand.





Here, you see the side of the fuselage with filler added to the seams and blemishes in the surface of the sheeting. To minimize the amount of sanding needed, scrape off as much as you can before it dries.



Here, you see the filler sanded smooth. Most of it is sanded away, leaving only the low areas filled with dried filler. It might take two or three applications of filler and more sanding to completely smooth the surface of the fuselage.



Here, the front of the fuselage has its edge gaps filled and sanded smooth. Notice that the section under the chin has been left unsheeted; this area will be finished up after the wing has been built and the front alignment dowel has been installed.



Here, the fuselage is all sanded smooth, with the edge seams filled. A good way to determine if the seams are even and flush is to run your fingers over the joints. If you feel a bump, more sanding and filling is needed.



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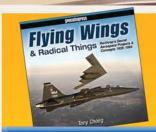
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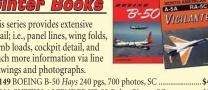


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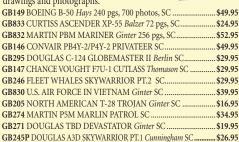
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Product Watch

Robart #148E Retracts

obart Mfg. has been in the retractable landing-gear business for decades, and the company has always been known for its outstanding quality and rugged, time-tested engineering. When it comes to giant-scale landing gear, many consider Robart the standard against which others are rated. Founded by Bob Walker, who was answering a need for dependable, shock-absorbing gear for the new generation of giant-scale airplane designs coming to market, the company today is in the capable hands of Mike Vasser and Dennis Crooks, both of whom are very knowledgeable and experienced in the manufacture and design of the Robart landing-gear line. A more recent development is the addition of electrically driven gear, and now just about all of Robart's retractable landing-gear sets, in all styles and sizes, are available with either the classic pneumatic drive system or the new electric jack-screw drives.

The Robart 148E gear shown here are used for aircraft with 90-degree rotating landing gear, such as the P-40 Warhawk, the F4U Corsair, the Grumman Hellcat, and the Douglas Skyraider. Sized for 82- to 90-inch-span airplanes, the gear fit precisely in the Top Flite giant-scale Corsair ARF and can be easily adapted to other similar-size plans-built warbirds. The 1/7-scale 85-inch-span Skyraider that I am using the gear for is actually a 15-percent-reduced version of the plans available from Nick Ziroli Plans (ziroligiantscaleplans.com).

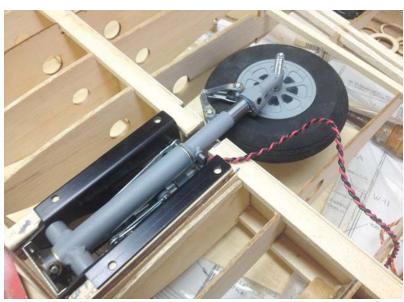
Constructed with aircraft steel and aluminum components, the 148E gear feature functional shock-absorbing oleo struts made out of 4130 chromoly steel and have 1/4-inch axles. The strut length measured from the pivot point to the axle is 7 1/4 inches, and the attachment footprint is $4 \times 21/2$ inches. The landing gear are ideal for use with 41/2-inch wheels and tires, which are also available from Robart in various styles.

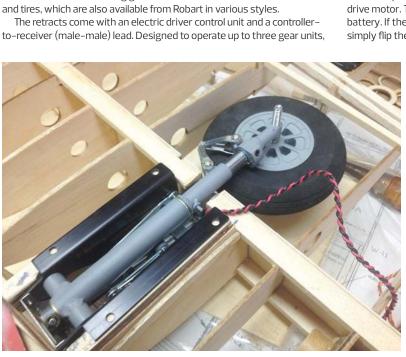
the system operates with a voltage of 4.8-9.0 volts, and the unit has several improvements over the original setup. DIP (dual in-line package) switches replace the older jumper plugs used to select the proper mode of operation. The control unit provides Amp-Out circuitry to sense the gear's up/down travel limits. It also protects the gear from becoming jammed by an obstruction, like a scale gear door. When the control unit reaches a preprogrammed amp draw level, it automatically shuts off the drive motor. This also prevents a strut that's "hung up" from draining the battery. If the retracts do amp out on an obstruction, all you have to do is simply flip the gear switch to reverse the gear away from the obstruction.

System status lights have also been added: Green means that everything is set up correctly, and a red light indicates that the control box is not connected properly or that the system voltage has dropped below a safe level. The gear themselves have two-pin connector leads that plug into the control unit, and extension leads are also available. For a more scale operation, you can also set the gear for a delay between the main gear and/or tailwheel retraction/extension cycle. The control unit can be powered by the receiver, or you can use an auxiliary battery pack by removing the power jumper. For setup, the instructions recommend setting the endpoints for your gear channel to 80% for down and 120% for the up position.

Priced at \$495.95, the Robart 148E 90-degree rotating retracts are an excellent investment for your scale RC airplane. They are a great value considering how well they're made and how long they will last under normal use. Also, should you happen to suffer a rough landing, there many replacement parts available for all Robart retracts. If you want a high level of quality, look no further.-Gerry Yarrish

robart.com





L. R. Hammond Co. RC Workstation

imple to assemble at the field, this workstation breaks down into a relatively small package to transport. Once at the field, it takes just three minutes and four cotter pins to get this thing up and together. It is adjustable to different heights and to various sizes of planes. The top cradle can rotate 360 degrees, and the arms will open to accommodate many different-size fuselages. It holds the planes very securely, and I like being able to rotate the plane around when working on it. The other advantage is that you are working right next to the plane, not bending over to reach it like you have to when it is sitting on a table. This saves wear and tear on the back. The tray at the midsection is perfect for holding all the bolts and nuts, along with batteries and other plane accessories. The only issue I had with it was in the wind because there is a large wing on the plane sitting at the top of this stand. An easy fix is to add a weight bag to the legs to give it more stability, but I would recommend you don't leave your plane unattended if you're outside.

When all is said and done, this is a nice workstation for the pits and at home. Once you get one, you will be sure to always bring it out with you when going to the flying field; it makes assembly, repairs, or just normal maintenance on your plane convenient. At \$79.95 (plus \$25.00 for shipping), you get a good product and your back will thank you. —John Reid

rcworkstation.com



Blade Quad Racer Tool Set

 $\label{eq:likely-want-this-tool-kit.} If you are racing quads, you will most likely want this tool kit. Housed in a nice canvas zippered pouch, which can easily fit into any toolbox or drone backpack, it has just about every tool needed to maintain or fine-tune drone racers. I like that all the tools are first-rate and made from good-quality steel.$

on the handles in large, easy-to-read letters; in addition, all the tips are replaceable and can quickly be removed by a single setscrew.

The motor holder prop installation tool looks like a pair of pliers and allows for a firm grip on the motor to keep them from spinning when

replacing props—no more cut fingers. A stainless-steel stamped wrench should accommodate nuts of most sizes on the quad, starting with a 4mm opening, then 5mm, 5.5mm, 6mm, 7mm, 8mm, and finally 10mm openings. The last tool is an easy-to-assemble and compact prop balancer, with adjustable feet to level it out on any surface. If you are looking for that extra bit of speed to get you through the gates faster, you will be using this tool. Balanced props are more efficient and help the quad fly smoothly.

All of these tools are well strapped

All of these tools are well strapped in the transport pouch and will not fall out. At \$76.99, this pack offers a lot of tools, and they are the ones every drone racer will use.

—John Reid

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Also available is the Servo Mounting Screw value pack kit (5745). The kit includes self-tapping Socket Head/Washer Head screws that are zinc plated and can be used for a thousand and one uses. From installing servos and securing hatch covers to holding engine ignition systems and other radio gear and electronics, this kit includes 100-count packages that cover all the popular sizes and lengths. Sizes include: #2x5/16, #2x7/16, #2x9/16, #3x7/16, and #3x5/8 inch. All the screws take a standard 5/64-inch Hex Allen wrench or ball drivers. Also included are free 50-piece packs of each for #2 and #4 Nylon Washers. These 1/4-inch outside-diameter washers are great for cushioning plastic and fiberglass cowls and canopies and help spread the load over a slightly larger surface. A total of 600 pieces costs \$27.85—a great value indeed. RTL Fasteners also offers handy multi-compartment boxes to help keep your hardware items organized and easy to find; their prices start at \$5.45.—Gerry Yarrish

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Fixed-Wing FPV Racing in Kualoa, Hawaii

ixed-wing racing took center stage last month at the Drone Worlds 2016. A culmination of a year's worth of national qualifiers, this event came to Hawaii's stunning Kualoa Ranch, notable as the setting for the 1993 action film Jurassic Park. The event attracted 23 passionate and skilled pilots from six countries around the world—the United States, Canada, Mexico, New Zealand, Korea, and France—each ready to compete against one another in an international, Olympic-style series.

"All of the best pilots were here," explains James "Bazinga" Haley, who flies with Team USA and is based in Champaign, Illinois. This made for a tough competition but also for exciting spectator action.

"Wings are loud, fast, and when they hit, there's carnage," says fellow Team USA pilot Steve Petrotto, also from Champaign. "From a spectator standpoint, there's nothing better."

For the pilots, it was the intense racing and world-class skills that pushed racers to their limits. "Emotions were running high," says Jeremiah Guelzo, of Lynchburg, Virginia, "and wing-to-wing action was frequent." As racing intensified, lap times tumbled, and racing got more and more exciting. "We were pushing each other to go faster," says Guelzo. The event wasn't without casualties, however, as world-leading pilots including Canada's Ryan Walker and New Zealand's Brad Pearpoint crashed or recorded "did not finish" scores. Meanwhile, USA's Josh Woodruff and Jason Glaze, Mexico's Erich Hernandez, and New Zealand's Cam Blick pushed hard for spots in the final but didn't quite make it, taking fifth, sixth, seventh, and eighth place, respectively.

As the final arrived, it was Team USA that dominated, taking three of

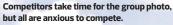


Steve Petrotto (brand manager for Blade drones and helis) on his way to another heat. At the end of the day, he would secure second place overall.

the four spots. Haley and Petrotto, who practice together regularly, took two places along with Guelzo and Norman Sidney, a top Mexican pilot from Tijuana, Baja California.

All pilots got clean, fast starts, with Petrotto and Guelzo providing wing–to–wing action as they fought for the lead in the early stages of the race. Haley and Sidney were never far behind, and on the third lap, Haley mounted an attack, hitting impressive sub–30–second lap times to pass Petrotto and Guelzo to take the lead. Despite fighting back, neither was able to catch the new leader, who maintained his position until the end. Haley took first, with Petrotto second and Guelzo third. Sidney put in a strong effort and finished close behind Guelzo for fourth place.

It was a dominant finish for Team USA, and Haley was ecstatic: "It's killer; it's awesome. You can't ask for anything better." And after a long, stressful competition, it was time for Haley to relax and enjoy the win in the best way possible: "I just flew up real high and looked out toward the ocean. It was nice to sit back and relax and hang out with the birds for a moment. No more pressure anymore." \(\pm\)





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